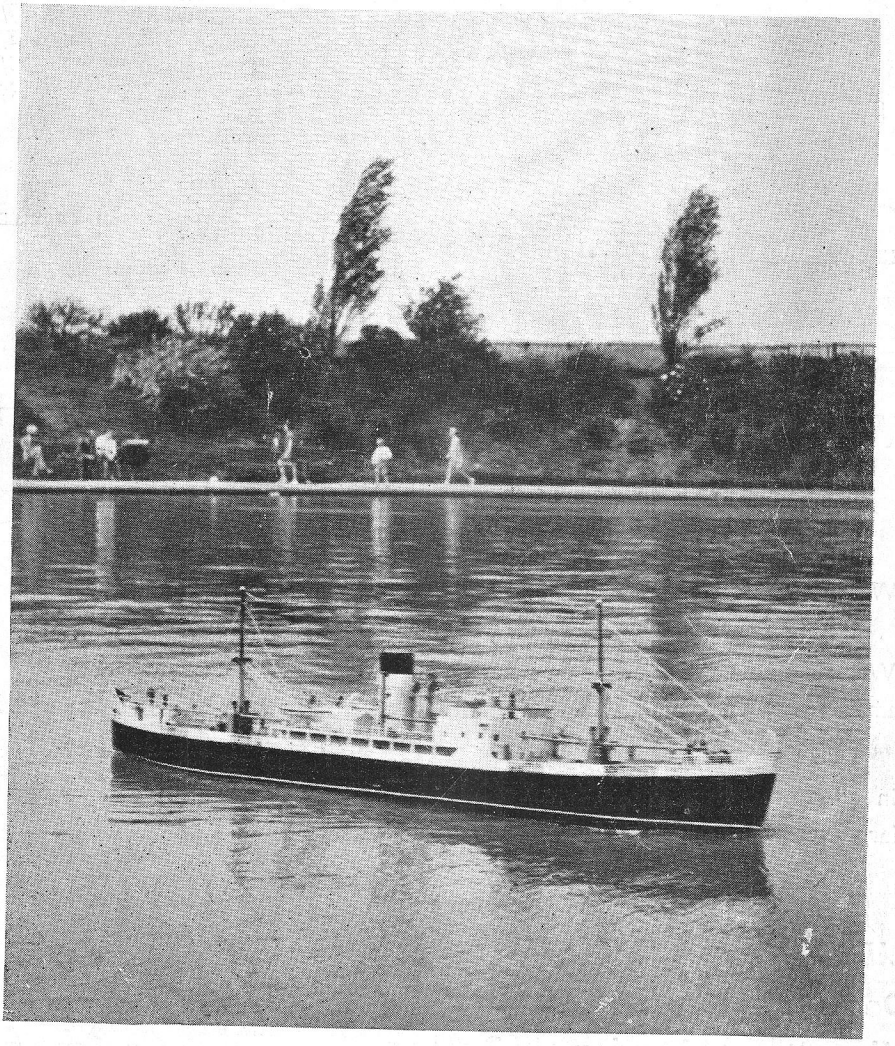
THE MODEL ENGINEER

Vol. 94 No. 2352 THURSDAY JUNE 6 1946 6d



Mr. A. F. Spence's Model Steamer "Seaweed" on the Exhibition Park Lake, Newcastle-on-Tyne

THE
MODEL ENGINEER

Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 94 No. 2352. JUNE 6th, 1946

SMOKE RINGS

A Track for Chingford

I AM pleased to hear that the Chingford Borough Council have extended a friendly hand to the Chingford Model Engineering Club, and have offered to defray the cost of materials for a track in Ridgeway Park, provided the Club undertakes the planning and erection. The track, as now planned, will consist of 1,200 ft. of three gauges, 5 in., 3½ in., and 2½ in., with sidings, platform and workshop. The official opening will take place on Saturday, June 8th, by which time about one-half of the track will have been completed. The Mayor of Chingford, who is also President of the Club, will perform the opening ceremony. Apart from the interest the track will provide for the general public, it will be another practical contribution towards the solution of the problem of keeping children away from the danger of the roads. The Hon. Secretary of the Club, Mr. F. W. Johnson, 63, Bromley Road, Leyton, E.10, will be pleased to answer any enquiries.

Left-handed Mechanics

OUR friends, the left-handed brigade, are up in arms and continue to ply me with evidence that there are far more of them about than I had imagined. I am glad to know this, and would again express my thanks for the interesting letters I have received. An apology, which I gladly make, is, however, due to the teaching profession. It appears that my correspondent, Mr. Wrangham and I are in the wrong in our assumption that insistence on right-handed practice still prevails in schools. Mr. W. J. Hughes, of Sheffield, himself a school teacher, tells me that we are quite out of date, and that the natural tendencies of pupils who may be either right-handed or left-handed in their writing and drawing are nowadays fully recognised and encouraged in almost every school. This is as it should be, and I am glad to know that there has been this real advance in educational methods since my own school-days of long ago. Mr. D. Bain, of Liverpool, has kindly written me a long letter on this subject, based on his own practical experience as a tool maker who is fortunately ambidextrous in his work, though even he admits that in twenty-five years' experience he cannot recall a left-handed mechanic. He is wisely encouraging his two sons to develop the use of both hands equally well. His letter is so full of workshop common sense that I am glad this subject has tempted him to break away from his customary reserve, and put pen to paper. Finally, I have had news that there is a left-handed potato peeler, as well as other left-handed tools, already on the market. The makers are Hawksley Stainless Ltd., Burdall's Buildings, Langsett Road, Sheffield, 6. They say that these appliances can be obtained through the usual trade channels, but they will be glad to answer any enquiries from interested readers as to local agents.

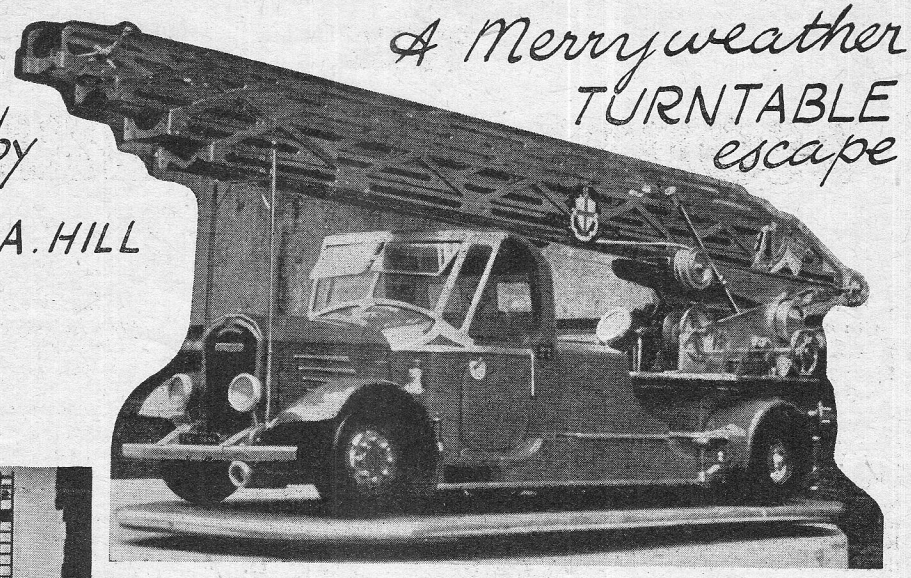
The "Toy" Complex

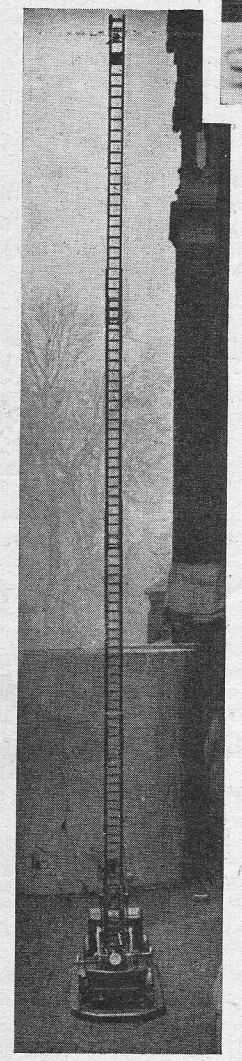
NEWS reaches me that in an important town in the Midlands the re-planning scheme includes the provision of a pond for model boats. But unfortunately the local Council only visualise a pond for children's "toy" boats! Why this restriction? Is it due to lack of space, or to the cost of making a larger pond, or to a failure to realise the growing demand for proper waters for both sailing and power boats of a larger and more serious type? The "toy" complex is, I am afraid, still much too prevalent in the minds of public authorities who have to consider the interests of model builders in connection with applications for boating, or railway, or model flying facilities. There is so much latent talent to be encouraged among the youth of the country, and so much of recreative value to be provided for the older generation, that the model makers of any community deserve every assistance which can possibly be extended to them by the powers that be. The model builder of today is the engineer, or the inventor, or the navigator, of tomorrow, and the future greatness of our country will largely depend on the encouragement we give to the technical genius of our race.

Percival Marshall

A Merryweather TURNTABLE escape

by T. A. HILL





HERE is a description of the model which won the Malden Medal of Merit for craftsmanship at that Society's exhibition last November. Being a Londoner, I had the opportunity of seeing these machines in action against the results of enemy onslaughts and a very inspiring sight they were against a background of flame and smoke, with a steel-helmeted fireman at the top of a hundred feet of swaying ladders, when most people's thoughts were of getting down below and the deeper the better. There is no doubt the memory of those days inspired me to turn out this model as good as it could be made. It is my first attempt at making a good model; but judging by what I saw at the Malden exhibition, I hesitate to think what some model engineers would make of the mechanical side of this fire-fighting appliance should they ever get as interested as I did. The entire model took nine months to complete and very little time was lost on the job during this period, spare time, of course.

The Chassis

This is constructed with wooden side-frames (American beech) and the cross-members are of the same material. At all points where the side-frames join the cross-members, box-section brass lugs were made up and soldered together and screwed to the wooden frames and cross-members. This was also done to the front and rear ends, to take the road springs and shackles. Four semi-elliptical leaf-springs were made from spring-steel (an old gramophone spring was annealed in the fire and cut down the middle) and the shackles were obtained from the links of a bicycle-chain. The front axle, tie-rods, brake drums, and steering gear were fashioned as near as possible to heavy lorry practice, as were also the radiator and bonnet, which represent true "Dennis" tradition.

The only tools at my disposal consist of a variety of carpenter's tools, a hand drilling-machine and a few taps and dies of the small sizes. Care was taken when making the bonnet to leave enough room underneath to instal two "Ever-Ready" cycle-lamp batteries for use in the lighting system. Difficulties were met when I tried to turn the edges and valances of the front wings over a block of hardwood shaped to pattern; but I cut out V-pieces and riveted them together on the underside with a piece of brass strip, rivets being countersunk and hammered flush and finished off with a smooth file. Any soldering was out of the question, as the material was aluminium. The same method was employed when making the rear wings, although these were by far the easiest to make as I had no side valances to contend with.

I then looked around to find some method by which to give the model propulsion. Not having seen some of the petrol engines which I saw at the Malden exhibition for the first time, though had I but seen them I have neither the plant nor

the necessary knowledge to construct one, I hit upon the idea of installing a No. 30 Garrard gramophone motor. This I positioned between the chassis side frames, in the bodywork behind the cab, as can be seen in the photograph. The governors and unnecessary gear-wheels were dispensed with, as I could see that the full power of the double springs would be required to drive the model. A connection by means of chain and sprocket was made to the near-side rear-wheel. Upon test with a 28-lb. weight across the chassis frame, it was found that the model ran very well. How far it will travel I have yet to find out, there being a limit between the walls of my home ; but by a rough estimation I would say twenty-five yards. I was still in trouble, however, due to the motor-winding gear being central in the chassis frame, and with the prospective ladders in mind, I could see that I should not be able to wind up the motor without elevating the ladders first. So I had to re-scheme the whole affair and eventually finished up by side-stepping the motor in the chassis frame.

The model has a full equipment of electric lights: two headlamps, one fog - lamp, interior cab light, searchlight and rear lamp. The front headlamps have reflectors and chromium rims and the glasses are frosted. Underneath the cab there is an electric bell of the household type.

Four jacks are fitted to the chassis frame and swing outwards and down when in use. This is the procedure before elevating and extending the ladders, the idea being to gain a firm base and to take all weight from the road springs. Two hose-boxes are fitted, one on either side of the vehicle ; both have hinged flaps, and are fastened to the

Mr. T. A. Hill, right, receiving the medal of merit for craftsmanship from the Malden and District Society of Model Engineers. Mr. E. T. Westbury made the presentation

The cab is made in true coachbuilder's style, being framed in ash and panelled in 20-gauge sheet aluminium. All inside framework had to be finished completely before assembling, all framework being stained and varnished, and panels enamelled in cream. Cushions and backrest are in red leather and pleated with green cord ; the floor and pedal-boards are covered with rubber matting. Dashboard is made of mahogany and has a complete set of instruments (imaginary, of course) illuminated with an electric bulb fitted underneath. A four-panelled windscreen is fitted with side windows, and the top halves of the front of screen are hinged and open outwards by means of a set-screw.

running boards, which also carry two imitation fire-extinguishers. All electric lights and bell are operated by push-buttons situated under the front of the turntable. The two chromium-plated bells, on either side of the driver's cab, are not of the ringing variety.

The Turntable

This is built up to clear the rear wings and is as true a copy as I could make of its Merryweather prototype. It revolves by means of the handwheel situated below its platform on the near-side of vehicle, through a worm and screw. The turntable is fitted with clockwork mechanism to extend the ladders and also to elevate them ; these

operations can also be done by means of hand-wheels, both of which can be seen on the near-side of machine. I had no intention to power the ladders; this came as an afterthought when I chanced to see an old Edison-Bell cylindrical recording gramophone on a stall in Leather Lane. I promptly bought it very cheaply for a few shillings and, after much fiddling about with same, installed it into its prospective position. It works very well and extends the ladders almost to their full height.

The ladders are in four sections, one main ladder and three extensions. They are made of wood and slide up and down on top of each other Each ladder side has a groove running the full length, and they are coupled together by means of flanged brass plates which travel along the grooves until they come to the stops which prevent their being over-extended. The ladder rungs are of wood and are inserted into the ladder sides and fixed with small screws. Pulleys are fixed to both ends of all ladders for the hoisting-cords to travel in. The hoisting-cords are fixed to the two drums on either side of the clockwork motor and these two cords only raise the second ladder; the first ladder, of course, does not move. The cords of the third and fourth ladders are fitted in such a manner that by extending No. 2 ladder, No. 3 and 4 automatically extend themselves. Their height fully extended is 11 ft. A small iron ladder pulls down from the underside of the main ladder to enable an imaginary fireman to come to ground. The hand-rails and trussing-rails were cut-out from alumnium and are fixed to the sides of the ladders by means of screws. This proved a very tedious job of repetition work, as there are 24 ft. in all.

A hinged platform is fitted to the top ladder, which also carries a swivelling monitor, and the panel shields of the City of London are on either side of the main ladder. The ladders are pivoted to the turntable elevator, and plumbing-gear is provided to enable the ladders to be adjusted to a considerable angle on either side by means of a screw and handwheel at the base of the main ladder. An indicator is fitted which gives the length of the ladders when extended.

The entire model is enamelled in red with two coats of varnish as the finishing coats. All aluminium parts are left bright and all brass fittings are chromium-plated. By the way, it is not a fire escape, but a turntable ladder, and these machines are not used to save life, as the handrails would make it a dangerous job for any fireman to attempt to carry an injured person down them. A special Davis life-saving gear is used for this purpose, by which the injured person is lowered to the ground.

The primary object of these machines is to throw a jet of water into the seat of the fire and to attack outbreaks of fire in high buildings and in lofts. There are one or two of these machines in this country capable of reaching a height of 150 ft., one of which I believe is in Hull. They are specially built for use on grain-elevators and grain storage tanks.

The Model Power Boat Association

AT the annual general meeting held on April 27th, plans were formed for the resumption of M.P.B.A. activities, and for the revision of rules, including those relating to finances, insurance, and classification of boats for competition.

The principal points on which decisions were reached are as follow:—

Affiliation Fees. The affiliation fees have necessarily been increased to meet rising expenditure, and now include Third Party Insurance, at the rate of 3s. 6d. (three and sixpence) per head per annum for any number of affiliated members.

Third Party Insurance. Provisional arrangements have been made for insuring all classes of boats against third party risks, up to £2,000 for any one claim; premium fees to be included in affiliation fees as stated above. Insurance is rigidly compulsory, and no boats of any kind will be allowed to run in competitions organised by the M.P.B.A. unless insured.

Competition Rules. Racing Boats.—Revised rules for the classification of racing boats are as follow:—

Class A: I.C. engines within a limit of 30 c.c., steam-driven boats restricted to an all-on weight of 16 lb.

Class B: I.C. engines within a limit of 15 c.c., steam-driven boats restricted to an all-on weight of 8 lb.

Class C: I.C. engines within a limit of 10 c.c., steam-driven boats restricted to an all-on weight of 5 lb.

Weight of boat to be taken with empty fuel-, oil- and water-tanks, otherwise in running trim. No boats having an all-on weight higher than 16 lb., or I.C. engines over 30 c.c., to be allowed in any circular-course racing events.

Other Types of Boats.—No definite decisions made for classification or new competitions, but the Committee have been instructed to examine the possibilities of extending the scope of straight-running and prototype boats in M.P.B.A. competitions.

Regatta Dates. The following fixtures have been provisionally arranged:—

Sunday, June 16th—Malden; Sunday, June 23rd—Altrincham; Sunday, August 11th—Blackheath; Sunday, September 1st—Grand Regatta (Victoria Park).

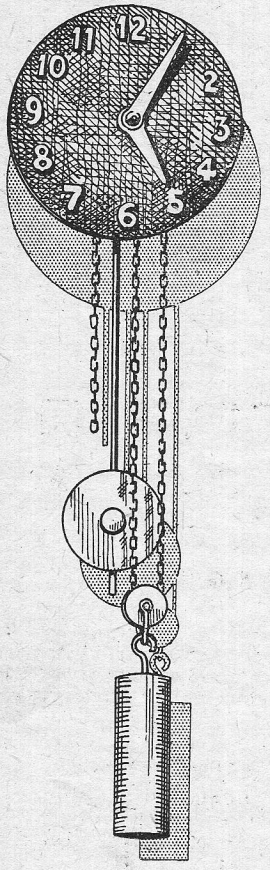
(Applications for other fixtures should be submitted as soon as possible to enable a complete fixture list to be prepared.)

Representatives. Clubs unable to send a representative to committee meetings may nominate a member of the standing committee to act on their behalf. The following committee members are willing to act as representatives of provincial clubs, and their qualifications or special interests are indicated:—Mr. Whiting (Orpington)—prototype; Mr. Mew (Malden)—steering; Mr. Walker (Malden)—speed and steering; Mr. Innocent (Victoria)—speed; and Mr. Weaver (Victoria)—speed.

All applications for affiliation, or enquiries on any matters connected with the M.P.B.A., should be made to the Hon. Secretary: EDGAR T. WESTBURY; 10, Oakhurst Rise, Carshalton Beeches, Surrey.

*A BRACKET CLOCK

By R.B.F.



IN the case of the pinions for the second and 'scape wheel, Fig. 17, chuck a piece of $\frac{5}{16}$-in. brass rod to run quite true. It will be noted that the term "run quite true" is mentioned several times; as it is almost impossible to do this in the self-centring chuck, it is suggested that the four-jaw chuck be used with the assistance of the clock-indicator. Of course, if the lathe is fitted with split draw-in collets or chucks it is all that can be desired for work of this nature.

Having made sure that the rod is truly chucked, face the end and drill a 3/32-in. diameter tapping hole for about half-an-inch down the rod and tap $\frac{1}{8}$-in. Whit. With a knife-edged tool turn a spigot at the outer end 0.153 in. diameter and 1/32 in. wide, to act as a guide for drilling the pin-holes.

Now mount the drilling spindle and, with a centre drill, using the division-plate, centre for eight holes with the inside of the hole on the circumference of the spigot. Now drill these holes $\frac{1}{4}$ in. deep with a No. 63 drill. With the parting-tool, turn off the spigot and part off one piece $\frac{1}{16}$ in. thick and a second piece $\frac{1}{8}$ in. thick. Two pinions are required thus.

Repeat all this for the intermediate pinion, Fig. 23, only in this case the spigot will be 0.068 in. diameter, and there will be only five pins, the holes for which will be No. 72 drill, and the centre hole will be 3/64 in. diameter and not tapped.

The wider of the two discs, in each case, will require spigots turned to a tight fit in each of their respective wheels, and great care again must be taken to see that they run true.

Fig. 18 shows the pallet; take a piece of clock-spring, anneal it by making it red-hot and allow to cool as slowly as possible; bend and file it to the shape shown, do not re-harden until it has been fitted and tried for exact shape and position.

Make the pendulum crutch, Fig. 19, out of a piece of mild-steel, drill and cut a saw curf at each end and press in a piece of 20-S.W.G. wire, bent as shown, and pinch up the ends in a vice to make it quite firm. The top hole requires tapping and fitting with an 8-BA screw.

From two pieces of brass, make the pallet spindle pivot brackets, as shown in Fig. 20, and provide two 3/32-in. Whit. countersunk screws $\frac{3}{8}$ in. long, with nuts and washers for fixing.

The minute-cannon and wheel is shown in Fig. 21. The cannon is made from brass rod and should be turned to the dimensions given. The bore must be an easy-running fit on the centre spindle, Fig. 2, one end of the cannon to be a tight fit in the minute wheel and the other end to be shaped to a square to accommodate the minute-hand.

Fig. 22 is the spring to keep the minute-cannon friction tight on the spindle to enable the hands to be turned for correct time; it is a cross of thin spring steel, $\frac{1}{2}$ in. diameter, over the four limbs, and has a 3/32-in. diameter hole in the centre; it is to be slightly dished as shown.

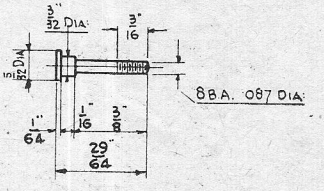


FIG. 12

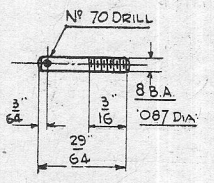


FIG. 13

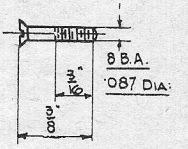


FIG. 14

Fig. 23 shows the intermediate hour-wheel and pinion. When the pinion shroud has been pressed into the wheel the pins can be fitted; for these, take a piece of 23-S.W.G. steel wire,

*Continued from page 527, "M.E.," May 30, 1946.

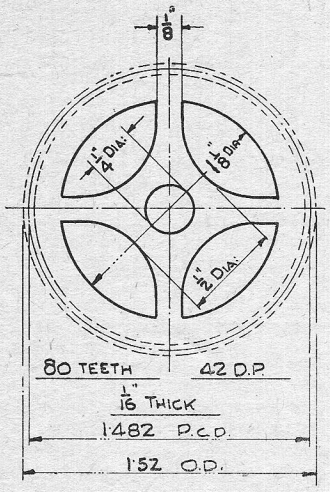


FIG: 15

clean it carefully and tin it all over for several inches. Thread the plain shroud on and insert the end of the wire in one of the holes in the wheel shroud; touch with a hot soldering bit and cut off about a $\frac{1}{4}$ in. long. Repeat for each of the five pins; then, pushing the plain shroud up until there is about $\frac{1}{8}$ in. between, flow solder over the end to seal the pins and make secure; clean any solder from the bore.

The hour-cannon, Fig. 24, can now be made from a piece of brass rod turned to dimensions given and bored to run freely on the minute-cannon. The end should be filed to a slight taper to form a friction fixing for the hour hand.

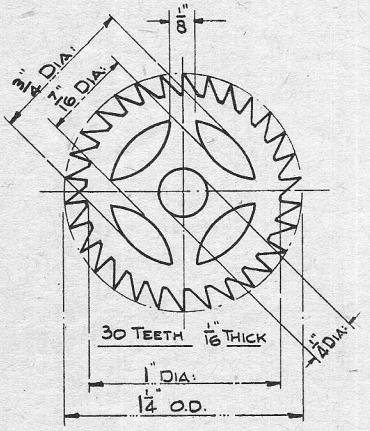


FIG: 16

The pendulum-rod is just a piece of 20-S.W.G. steel wire, about 9 in. long, bent to a plain hook at one end. The weight, or bob, is a disc of brass, $2\frac{1}{2}$ in. in diameter and 1/32 in. thick, and the centre consists of a special pin turned from brass; a $\frac{1}{16}$-in. hole is drilled through the shank, for the rod, and the whole secured in position by an 8-BA screw, as shown in Fig. 25.

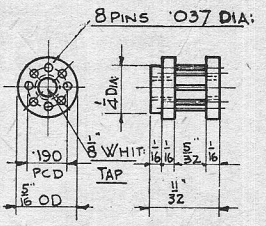


FIG: 17

That about completes the making of the working parts, so we must now take the frame in hand. Three pieces of good plywood, or well-seasoned beech, each $\frac{3}{16}$ in. thick and $3\frac{3}{4}$ in. wide by $4\frac{3}{4}$ in. long, form the plates; they should be quite square and true. Clamp them together and drill the four corner holes, 3/32 in. diameter; while the plates are still together, cut the slot in the top.

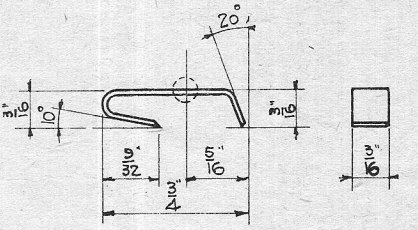


FIG: 18

Separate, and screw the front and middle plates, Fig. 26 and 27, together with slave-bolts in each corner; mark out a vertical centre-line and the cross centre-line for the main spindle,

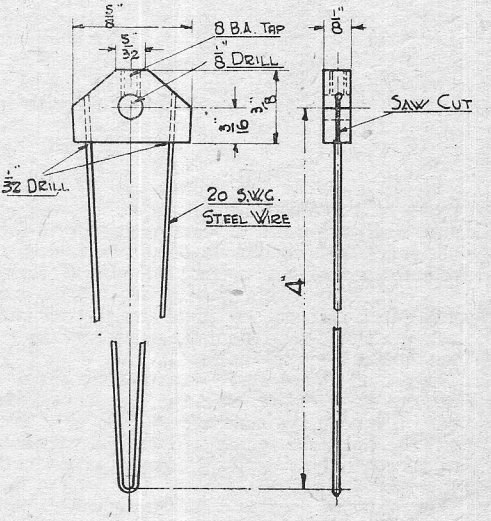


FIG: 19

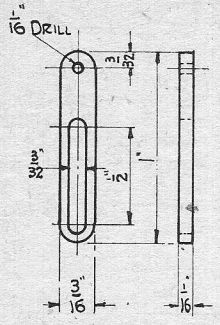


FIG: 20

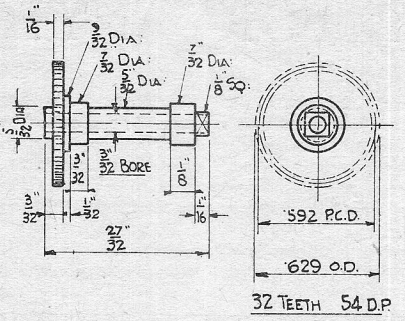


FIG: 21

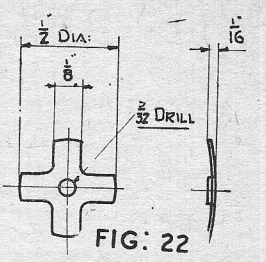


FIG: 22

then another centre 1½ in. towards the top, for the 'scape spindle. Then, with dividers, carefully strike an arc of 1.238-in. radius from the centre spindle and another arc from the 'scape spindle of 0.836-in. radius, these to cut each other on the right side of the vertical centre - line ; this gives the centre for the second wheel spindle.

Drill 1/16-in. holes on each centre and separate the plates. Screw the front and back plates together, in the same way ; mark out and drill the hole No. 50 drill for the fixing screws for the pallet spindle brackets. These holes have to be tapped 3/32 in. Whit. and countersunk on the back of each plate. Separate the plates and enlarge the holes so that the pivots of the respective spindles run freely. See Fig. 26, 27 and 28.

(*To be continued*)

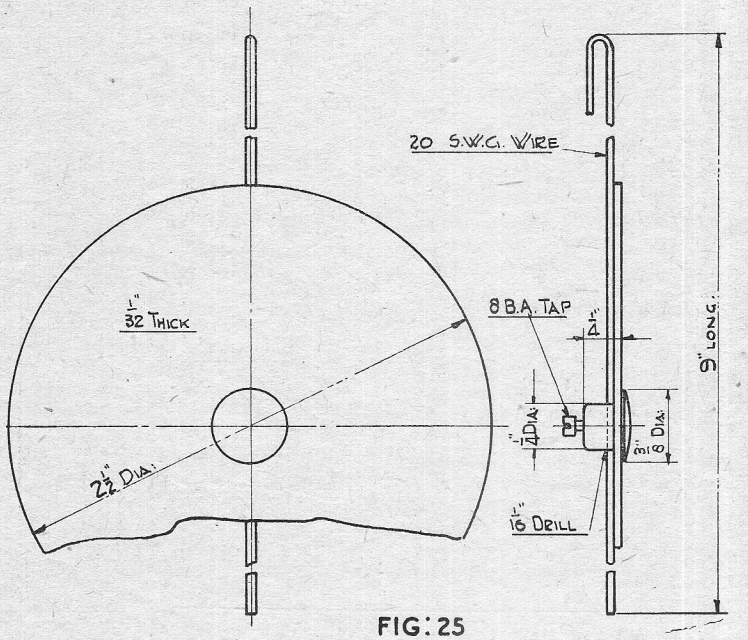


FIG: 25

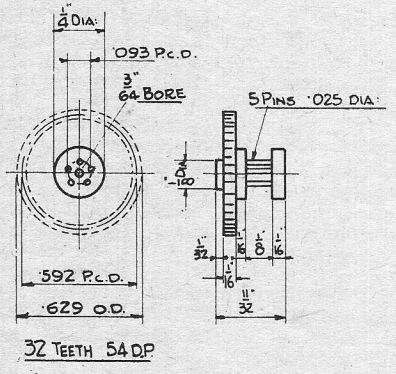


FIG: 23

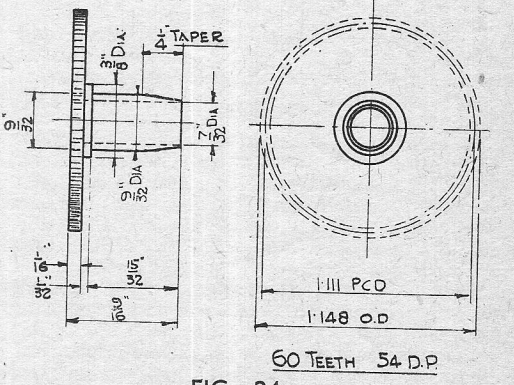
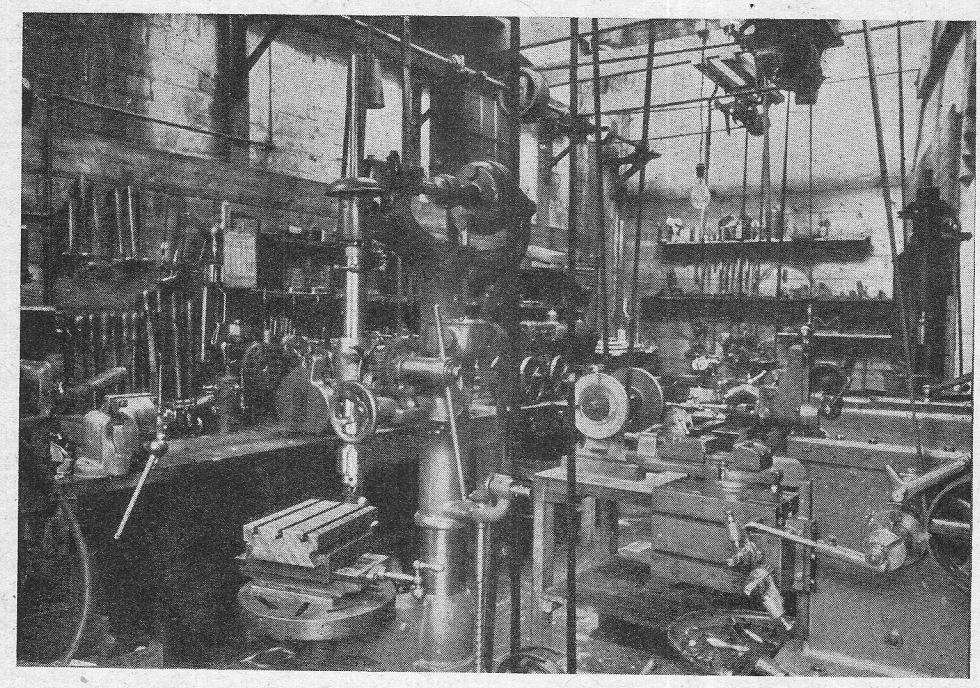


FIG: 24

READY FOR ANYTHING!

AMONG the interesting correspondence on the subject of left-handed mechanics which I recently received, was a letter from Mr. P. J. James, of Worcester. In confessing to being one of the left-handed brigade, Mr. James mentioned that he had a private workshop to which he happily retires in the intervals between the claims of a rather strenuous business. Here is a photograph of the workshop, which he kindly enclosed with his letter. Mr. James did not tell me anything about his model-making activities, but in the picture I can discern a partly-finished locomotive, a model liner, and a small vertical steam boiler. I gather from these clues that Mr. James has a wide range of interests, and with the ample equipment available, I think our title "Ready for Anything" aptly fits both the workshop and its fortunate owner.—P. M.



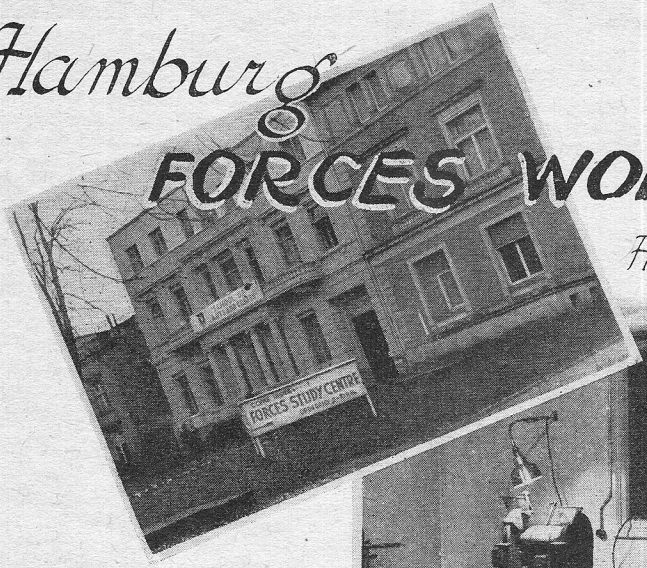
A SOCIETY PERSEVERES

IN February, 1945, the Automatic Telephone & Electric Company's Sports and Social Organisation held their first Arts and Crafts Exhibition, when about thirty models were on display. At this exhibition the idea was born to a couple of model engineers that a society should be formed. It was not until the following June that the idea blossomed forth at a meeting. The name was to be the "A.T.M. Model Engineering and Allied Crafts Society." Unfortunately, this first meeting was poorly attended, and at the fourth meeting the few members who turned up, decided that the idea was a failure. From this moment, the society was considered extinct, but, plans were laid for reorganisation, even in face of lack of support. On September 4th, 1945, a meeting was called, as most model engineers in the firm were by this time known. This meeting was, again, not well attended, but keen men were there, and it was decided to restart activities under the name "T.A.M. Society of Model Engineers." Some very interesting meetings have since been held, and visits to the Mersey Railway and the engine-room of a Ferry-steamer have added further interest.

On Sunday, April 14th, 1946, the sports and social organisation held their second Arts and Crafts Exhibition, at which the society had a stand. Visitors almost over-crowded a portion of the stand where six models were working under steam from a marine-type steam plant. Two of these models, a miniature double-acting oscillating engine and a horizontal high-speed engine, were particularly interesting in that they were made without the aid of any tool larger than a wheel-brace, and were made by Mr. W. Davies and Mr. H. Smith, respectively. Another member, Mr. C. Preston, had his latest model turbine under steam.

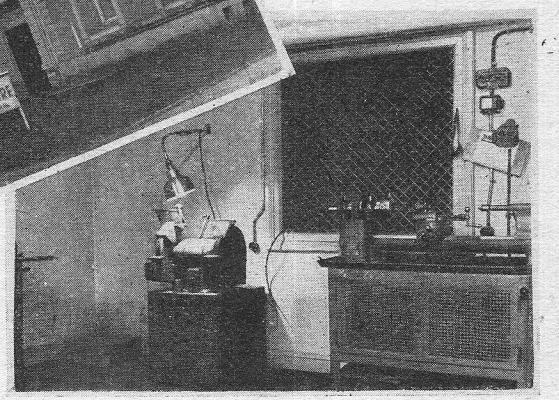
Hamburg FORCES WORKSHOP

H. R Hadlow



The home of the Forces Workshop in Hamburg

Photos by Pte. G. V. Kitts



Tool grinder and small lathe. Behind the grill is the tool and material store

THE writer had an extremely pleasant surprise a few months back, when he visited the Hamburg "Forces Centre," as it was then called, with a view to finding out the types of books housed in the library there. The Centre was well laid out and it was decided to have a "nose around" as soon as the book borrowing had been completed. The library was found to contain a wide variety of fiction, biographical, technical and scientific works, and having chosen a couple of books, the tour of inspection was begun.

In the writing and reading rooms were plenty of up-to-date periodicals of all kinds, and some well-upholstered armchairs, these all being occupied by—apparently—contented members of H.M. Forces. There was also an information room, devoted to a copiously illustrated wall newspaper; a display of plans and photographs of "pre-fab." houses of all types; a table (of football-field dimensions) on which was laid out a large selection of informative leaflets and booklets such as "Release and Re-settlement," "Return to Civvy Street," etc., and scores of "ABCA" (Army Bureau of Current Affairs) pamphlets dealing with all manner of subjects of vital interest to members of the Services.

Up on the second floor was the art wing. Here one can take a complete course or receive a helping hand on a difficult point on commercial art, life, costume or general drawing and design. This wing is very popular, and is capably run by Sergeant Darking of the Army Education Corps.

And then to the basement, where are the rooms housing the "crafts" side of the Centre, that is carpentry, leatherwork, perspexwork, and last, but not least, metalwork. All of these rooms are well equipped with benches, tools and materials. During the daytime set courses of study are held, but in the evenings Service personnel can pursue their hobbies to their hearts' content and in their own free way, though an instructor is usually on hand to assist on any problem.

The metalwork section, which is probably of more interest to readers than any other, was very overcrowded, containing as it did four or five large benches with vices, two lathes and a bench-drill. But since the first visit of the writer, the whole section has been re-organised, the work-benches having been moved into two adjoining rooms, thus leaving the original room for use mainly as a machine shop.

As can be seen from the illustrations, the machine tools consist of the two lathes, tool grinder and bench-drill, while for the sake of convenience two small benches (one fitted with a vice) have been left in the room for the fitting and assembling of machined parts.

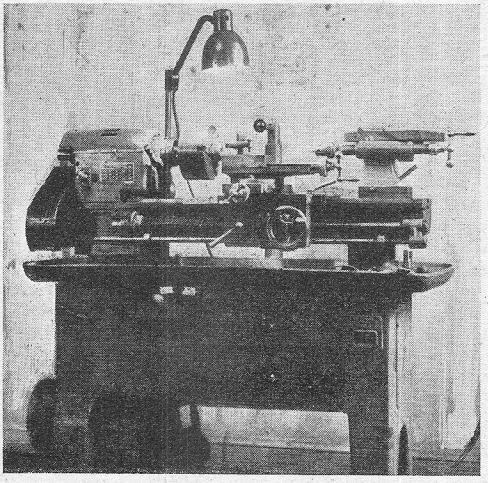
The Leinen lathe is a real gem, and would delight the heart of any model engineer fortunate enough to own it! This particular specimen has a label attached, stating that it is a wartime production; it is only in external finish that it appears to differ from the pre-war tool, however, and the "feel" of the hand-scraped slides and the silky running of the large spindle makes it a real joy to use. But the equipment with the lathe was very meagre when the writer first started

instructing at the Centre. The only attachment usable was the three-jaw chuck; no faceplate or driverplate, and no means of drawing-in the complete set (up to 20 mm.) of collets available. This latter omission has been remedied, and a faceplate (and angle-plate) will soon be in use, as castings have been ordered from Tom Senior and at the time of writing are on their way out. The addition of the faceplate will be invaluable, enabling odd-shaped jobs to be machined, which is impossible at present. A Jacob's-type drill chuck and a complete set of change-wheels complete the equipment for this lathe, which, as can be easily imagined, is in constant use.

The other lathe is also of the precision class, though not screwcutting. Here again the equipment was by no means complete, there being no draw-in spindle for the collets (again complete up to 20 mm.), no drill-chuck and no faceplate. The draw-in spindle was soon made up, and the writer was fortunate in obtaining a drill-chuck, for which a new taper shank was turned and fitted by a member of the class. A faceplate is not needed so much on this lathe, as it is really only suitable for light work, being fairly light in build and having high spindle speeds.

Both lathes are fully motorised as are also the bench-drill (which takes up to about 9/32-in. drills) and the big double-ended tool-grinder. The acquisition of a drilling machine of larger capacity would be of great value, as, strange to relate, there is not a breast drill in the whole building, and one has to resort to the lathe for drilling holes over 9/32-in. — and the lathes are in great demand, so it is often a case of checkmate!

A wide range of hand tools of all kinds is available (of English and German origin) and a reasonably complete selection of materials, though some of this is becoming increasingly hard to replenish. Hand tools and materials are kept in a separate storeroom, seen through the grill in the machine-shop illustration.



A Leinen lathe in the Forces Workshop

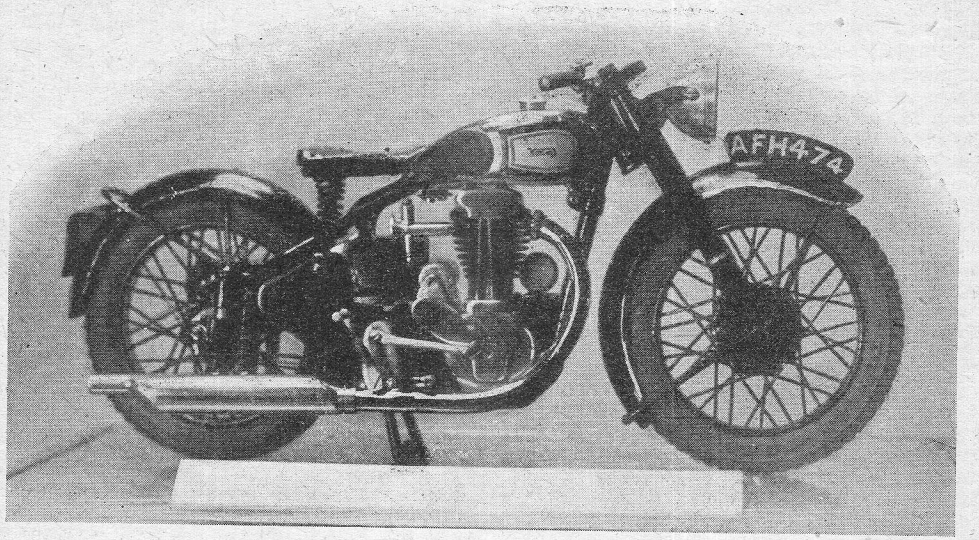
The type of work done in the metalwork section covers wide ground. One man, a radio enthusiast, made a quite complicated chassis in aluminium for a short-wave radio set; it was his first attempt at metalwork and the finished article was a credit to him. Two very fine copper fruit dishes were made by another man, whose enthusiasm was greater than his technical knowledge when he first joined the class. A copper teapot was the choice of another member of this class. One regular evening visitor has helped the writer in remedying the deficiencies in lathe equipment; another was making good progress with a stationary steam engine before he was posted away from Hamburg. And so on, *ad infinitum*!

The biggest headache of the writer is the answering of the (continual) question, "What can I make now?" and his weekly copy of THE MODEL ENGINEER is eagerly devoured as soon as it arrives; many men will become recruits of their local model engineering societies, and regular readers of "ours," as soon as they have settled down to civilian life again. The completed tender for the Austerity 2-10-0 locomotive being built by the writer (described in THE MODEL ENGINEER) evoked great interest; and the work that is now being done on the locomotive itself is causing so much comment that it seems certain that someone will very soon get bitten by the "live steam" bug—it is to be hoped so, anyhow! If any reader would like to add some fuel to the fire of model engineering, then let him look out any duplicate copies of THE MODEL ENGINEER and send them out here—they will be well used!

A word of thanks must be given to Captain Clem Handley, officer in charge of the Centre (or as it is now known, "The School of Arts and Crafts"), for his enthusiasm for his work there. The school is doing good work, and covers a side of the welfare and education of the Forces that was unavoidably neglected during the war—long may it flourish!

Shrewsbury Readers, Forward!

WE are pleased to hear that a model engineering society is being formed at Shrewsbury, under the auspices of the Technical College. In this connection a summer evening class in model engineering is to be conducted by Mr. W. T. Howard, B.Sc., and assistance in the workshop will also be given by Mr. G. Phillips, A.M.I.P.E. Full information may be obtained from Mr. Howard on request. The Head of the Engineering Department, Mr. R. H. Garner, thus aptly sums up the aims of the new Society:—"It is felt that in this Society lies one method of developing the skill and ingenuity of many engineers along directions in which they are most interested, namely, locomotives, stationary engines, boilers, aircraft and other pieces of mechanism, and, in so doing, this will keep alive the craft and foster pride in workmanship."



A MINIATURE MOTOR-CYCLE By H. W. HOOPER

THIS model, one-eighth actual size, is of the latest 49c-c.c. o.h.v. Norton, with sprung rear wheel and telescopic front forks. The greater portion of the model was made from solid metal. The wheels were made as follows : A strip of brass was cut to approximate size, a piece of brass wire silver-soldered along each edge, then bent round a piece of tube and the ends silver-soldered, thus forming the rim. Holes were then drilled to take the spokes, the hubs having been turned on a lathe, and also drilled for spokes, the latter being large pins, which were laced correctly and soft-soldered in position, the hub and rim having previously been fixed in position on a block of wood as a jig.

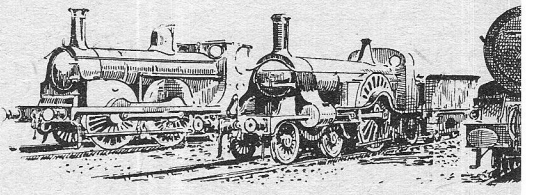
The tyres are ordinary stock Mecanno ; but as these were rather small in over-all diameter and large in section, they were placed in boiling water for a few minutes then stretched on the wheels. The front forks were fabricated from various sizes of small brass tube, fitted with silver-steel plungers and sprung with small wire coil-springs.

The exhaust-pipe was made from a short length of $\frac{1}{4}$-in. petrol-pipe bent to shape. The silencer was turned from a piece of aluminium bar. The saddle was fabricated from brass strip for the framework with a rexine cover. The mudguards were made from $\frac{3}{8}$-in. copper tube annealed, filled with sand, and bent to shape, filed on the inside until split, then bent to shape.

Encouraging the Juniors

WE are pleased to hear that the Welling Society recently held a special " juniors' night " for the display of work done by the younger members and their friends. We think this is an idea which might well be followed in other quarters, for one of the best things any society can do is to encourage handicraft and engineering interest among the rising generation. Many societies admit juniors to membership with certain restrictions as to age and voting power, and there is no doubt that the younger people view with admiration the elaborate work of their seniors, which they are able to inspect at the meetings. But, they have a natural reluctance in many cases to put their own simpler and perhaps rather crude efforts on view alongside the star productions of their elders. A special juniors' night would remove this fear of unfavourable comparison and criticism, and, more likely than not, would bring to light some unexpected talent and ingenuity worthy of further encouragement.

Small prizes could be offered for the best pieces of work, and these might appropriately take the form of useful tools, books, or materials. If the funds of the society did not permit of an extensive prize list, we are sure that some of the senior members would be only too pleased to supplement the official prizes with one or two extra rewards for good workmanship, originality, or neatness of finish. The value of an evening of this kind would be amplified if a senior member gave a short lecture on model making embodying a few practical workshop hints, and perhaps pointing out some of the good points and the weak points to be noted among the exhibits. An occasion of this kind could be thrown open to non-members and a tactful invitation to the handicraft teachers in local schools might bring along some very welcome additions to the display. Every society must look to the younger generation to build up its membership as the years go on, and early encouragement is the first practical step.



LOCOMOTIVES W

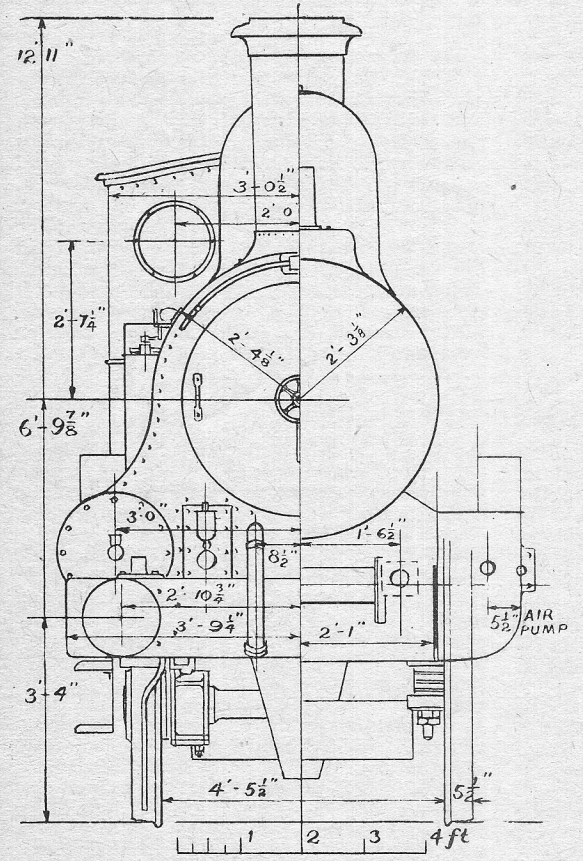
By F. C. H

No. 14—L.N.W. Rail

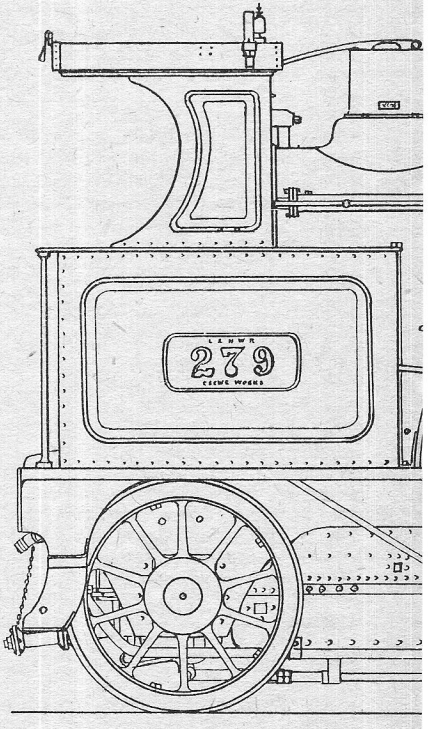
HOW often I have thought what fun it would be to write a complete volume about some particular locomotive. Such a book could be planned as follows: Introduction (including a little sentimental gush !), reasons for the design, technical details—these might well run into thousands (phew !) and, as grand finale, anecdotes concerning the chosen one's career. Add a few hundred drawings, and there's the perfect article !

But engine history is long, and life is short, declares the old saw, and at the moment there is only time to mention a few more items of mechanical interest, and to describe the tender which accompanied *Hardwicke* in her later, and immortal feats of speed. First of all, the regulator handle—that vital lever of the iron horse. An elegant thing, with *such* a pleasant 5-in. handle, around which the hand closed with a feeling of ease (except when the regulator valve in the smokebox felt "jammified"—then, indeed, a case of "all hands to the pump !"). I once turned up a full-sized model in wood, and went a-hardwicking with the thing in my hand, and with my head full of August 22nd, 1895, and the Shap gradient !—a great experience, I can assure you. Next, the reversing wheel. There was a particular "feel" about a Webb wheel. It turned very smoothly, and its thick circular 1½-in. rim, and the little bail-headed handle, were both nice to the touch. I used to think, as I lovingly fingered them, how very familiar those same impressions must have been to hosts of the great engine-drivers of the old days—Ben Robinson, Leigh Bowden, David Button and Jesse Brown, to mention but a few of the experts.

It was nice to receive the same impressions oneself—to tread, as it were, in the footsteps of the giants of yore. This sharing of traditions is

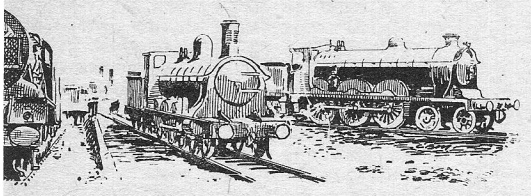


Front elevation of the lovely "Stephenson" class



An exc

a wonderful thing, and, of course, a marked characteristic of our race. One of these days I shall build a summerhouse in the form of *Hardwicke's* cab, and sit on the side splasher, drinking tea with good loco-modeller pals the while, and



ORTH MODELLING
MBLETON

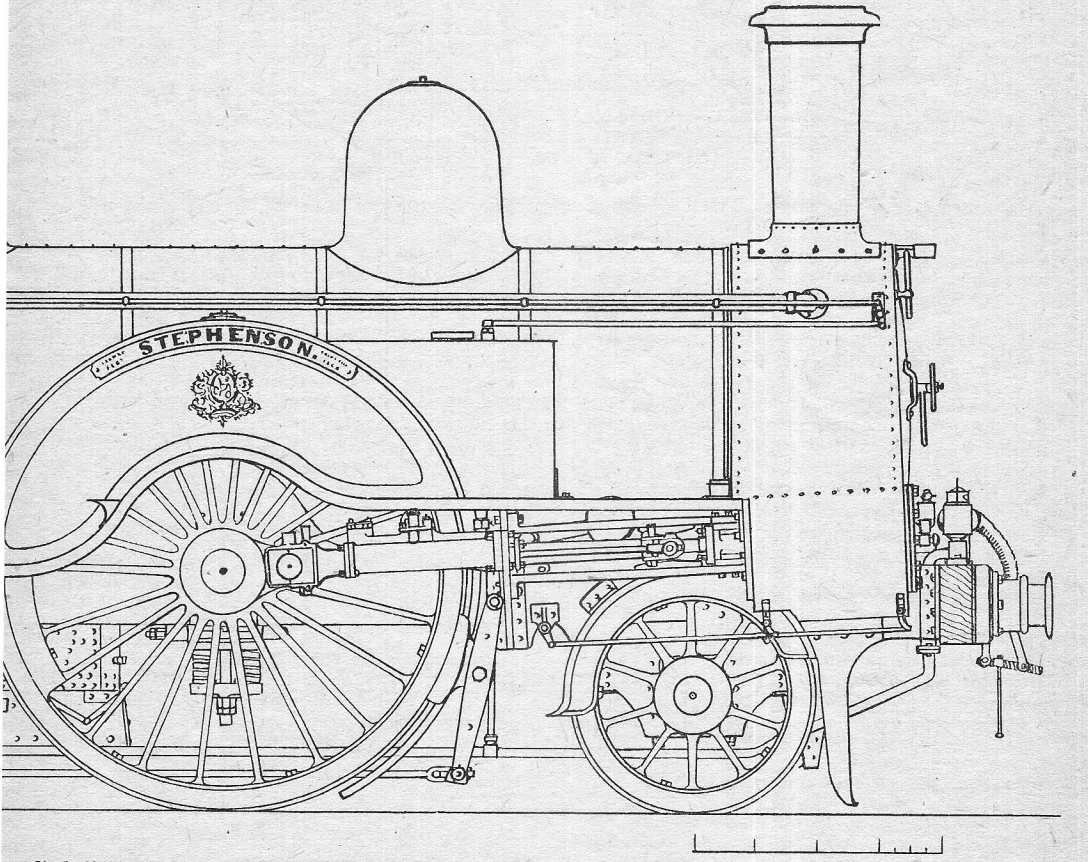
y No. 279, *Stephenson*

anon looking out over the side panels to see if the shunt signal is giving me the " right-away " !

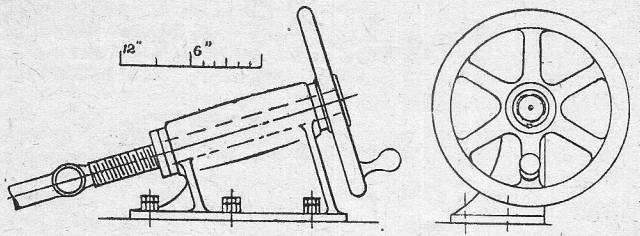
The Jumbo's connecting-rod was a standard fitting ; the big-end with two cotters struck one as a big affair. The forked small-end was introduced in the far-away days by Alexander Allan, when Crewe first began to build engines, and it has remained with the L.N.W. ever since. Plenty can still be seen on the " coal tanks " yet running.

The crosshead was bored taper to receive the piston-rod, and two cylindrical lugs, top and bottom, held the pair of 12-in. slippers, two slide-bars only, being employed on the " Nor'-West." In general design, too, the tender belonged to the years when Allan & Trevithick reigned at Crewe. With a total wheelbase of only 12 ft. 6 in., and weighing only 12 tons 2 cwt. empty, and 25 tons loaded, it was a remarkably small thing for a locomotive to drag about. That was largely thanks to the Ramsbottom water-scoop (introduced in 1862) which enabled them to keep their 1,800 gallons of feedwater replenished en route. The frames were made of wood, one of the reasons for this being the theory that in the event of a collision the tender would smash up first, thus acting as a kind of buffer betwixt engine and carriages.

The floor of the coal space was also formed of planking, and the fireman went straight for the coals, as there was no containing plate or coal door. The brake-wheel actuated six wooden brake blocks. These blocks were also connected



nt little " Single wheeler," with all the best characteristics of the L.N.W.R.



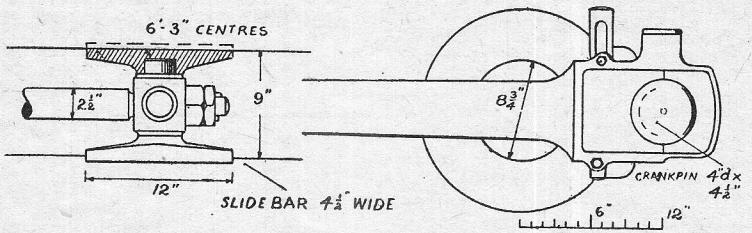
A pleasant reversing wheel with an excellent "feel" about it

by a combining lever with the engine steam brake—an ingenious system which allowed for the give and take occasioned by the compression of the two tender buffers separating engine and tender. On the top of the tank (right-hand side) were two curved rods, shaped much like ship's davits, with an eye forged at the top. Through the eyes was threaded the emergency communication cord, which ran along the edges of the carriage roofs and was attached to the engine alarm-whistle. Traversing a sharp curve, or shrinkage due to rain, sometimes caused a false alarm. Thus the enginemen were left to choose between either of these causes, or the possibility of a genuine emergency arising amongst the passengers! At the time of *Hardwicke's* record run there were no coping rails surmounting the tender, these being added at a later date.

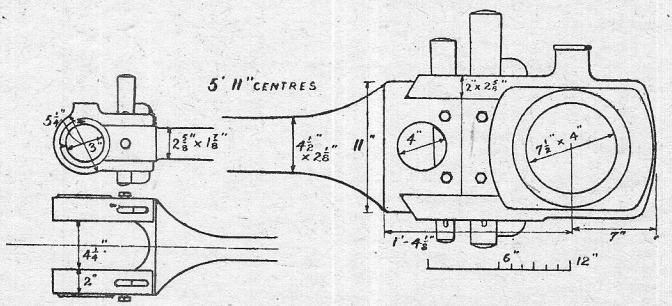
Towards the close of the century a marked increase in the weight of express trains took place. But the Jumbos, excellent as they were, didn't grow any bigger, and as these 166 engines, and their 90 slightly smaller sisters (differing only in having 6 ft. 3 in. driving wheels) constituted the major part of the main-line locomotive stock, resort was had to the extensive use of "double-heading." When a combination of a Jumbo and a "six-foot" engine was employed, no diminution in high speeds could be observed. What they achieved together was oft-times marvellous. But this was not the only combination, for included in the express stud were the sixty Ramsbottom 2-2-2 *Problem* class. Webb, in his early days as chief draughtsman at Crewe, had been largely concerned in their design, and he saw to it that from time to time they were brought thoroughly up to date. Steel boilers, thicker tyres and cylinders were amongst the items on the renewal list, and thus equipped, the engines proved of immense value.

Hence it was commonplace to see one engaged in "double-heading" a Jumbo on some crack express. I shall never forget the first time I saw this particular combination tearing through Willesden Junction. "Tearing" is just the right word to express my feelings. With breath-taking speed the engines swept down on me, and I remember thinking how curious the 7 ft. 6 in. single looked, with her low front and high driving wheel, rather giving the impression that the Jumbo would soon push her over, chimney first, on to the rails. That was my first introduction to the class. But I soon found out that the *Problems* knew quite well how to take care of themselves, and could run as fast as the Jumbos. And when I saw one, face to face, resting in Euston, I began to realise what beautiful locomotives they really were. They looked particularly well when viewed from a point just to the rear of the cab, and looking forward, and if they happened to come to rest with their connecting-rod on the top centre, and the observer was standing at rail level, things were just about perfect. They had such wonderful names, too. *Erebus*, *Harlequin*, *Mazeppa* and *Majestic* wanted some beating. The eminent engineers were remembered, *Watt*, *Stephenson*, *Locke*, being of the number, together with *Edith* and *Eleanor*, not women engineers, but, I believe I am correct in stating, the two daughters of the brilliant and genial designer himself, John Ramsbottom.

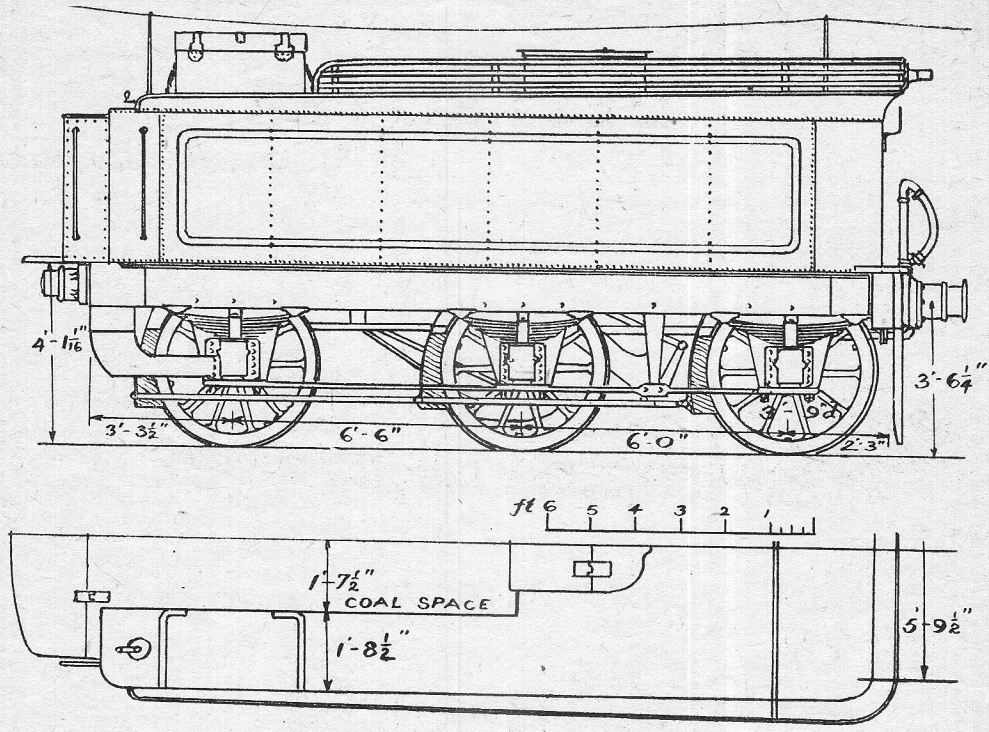
Yes, fine-looking engines, right enough. You just try one, good locomodeller, and see for



Standard L.N.W.R. crosshead, and big-end of connecting-rod as fitted to the rebuilt "Stephenson"



Standard L.N.W.R. connecting-rod with traditinal "small-end."

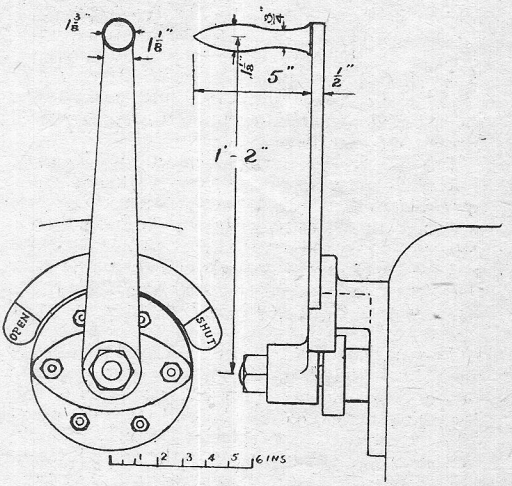


The standard 1,800 gallon L.N.W.R. tender

yourself. Of course, in their original state, i.e., green paint, slatted splashers, and the handsome J. R. chimney, they were indeed, dainty engines. No wonder *Lady of the Lake* walked off with a gold medal! But with the closed black splasher, Webb boiler mountings and cab, they assumed a new dignity, which, I am bold enough to say, placed them in the front rank of locomotive society. My drawing of *Stephenson* shows her in these later days and thus bedight. Complete with steamheat valve (on cab roof) and her cross-head air-pump, she majestically ran her course over the far-famed L.N.W. track, "tink-tinking" the while, and gladdening the heart of every locomotive lover who was fortunate enough to see her.

The dimensions of *Stephenson* when last rebuilt are :—

Cylinders, 16 by 24 in. Ports, 1½ and 3¼ by 13⅜ in. Lap, 1 in. Lead, 5/32 in. Valve travel, 3⅜ in. Eccentrics, diameter, 13 in.; width, 2 13/32 in.; throw, 5 in. Eccentric rods 3 ft. 10 in. Expansion link, 1 ft. 3 in. Lifting link, 6 in. Boiler, length, 9 ft. 9⅞ in.; diameter, 4 ft. 2 in. Firebox, length, 5 ft. 5¼ in.; depth below centre line, 4 ft. 10⅞ in. Firebox to driving axle, 1 ft. 8 in. Pressure, 150 lb. Wheels, driving, 7 ft. 9 in.; carrying, 3 ft. 9 in. Driving axle, diameter, 7 in. Leading axle, diameter, 6 in. Driving journals, 7½ in. diameter by 8 in. Blast nozzle, 4¾ in. Buffer-beam, 6¼ by 15 by

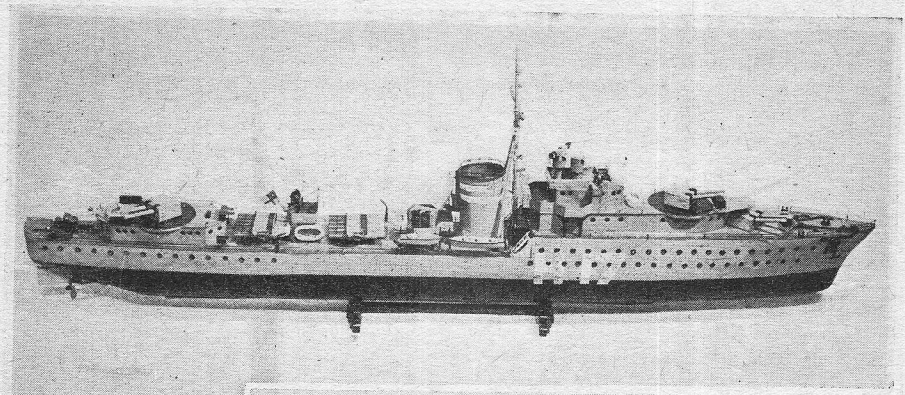


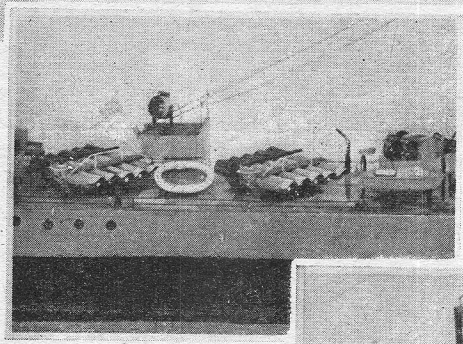
The regulator handle which started and ended many a famous run

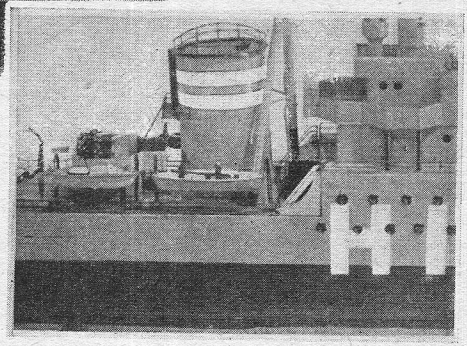
78⅛ in. Buffer-beam to leading axle, 4 ft. 0 in. Wheelbase, leading, 7 ft. 7 in.; trailing, 7 ft. 10 in. Rear overhang, 2 ft. 6 in.

"J" CLASS DESTROYER

by M. and R. Chapman







WE have completed a model destroyer of the "Javelin" class, and perhaps the photographs and a few details would interest other readers.

The model was commenced in March, 1943. The plans were all drawn from a picture which appeared in *Britain's Glorious Navy*. The hull is built up bread-and-butter fashion, made correctly to shape externally; then each layer was hollowed out separately. The pieces were then glued and screwed together, four or five slabs of glue being used, and eighty 1-in. wood screws!

The propeller tubes came next, and were made from an old-fashioned umbrella-stem. Brass bushes were shrunk on each end, with a hole through, smaller than the hole through the tubes. This reduced friction quite a lot and, more by luck than judgment, they both proved watertight when the shafts were running. The port-holes are shoe eyelets driven in tightly-fitting holes.

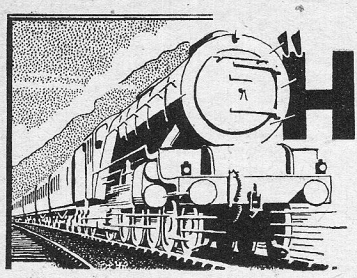
The superstructure was made from discarded sheet-steel and biscuit-tins. The railings are umbrella-wires soldered together, and were obtained from the local barber, whose son (Mr. R. Dunn) took the photographs.

To describe in detail the making of the superstructure, would cause a serious paper shortage; but it was a good exercise for testing one's soldering-ability patience.

The two propellers are driven by an old klaxon-horn motor working from three 2-volt accumulators, which, although they do not drive her along at thirty knots, give her quite a good turn of speed. All navigation lights are provided; they are pea-bulbs worked from a dry battery in the hull.

The name we decided for her was *Kelvin*. The number on her side is, of course, only show, and not correct. She is 5 ft. 2½ in. long.

This job was completed before we were twenty-one (we being twins).

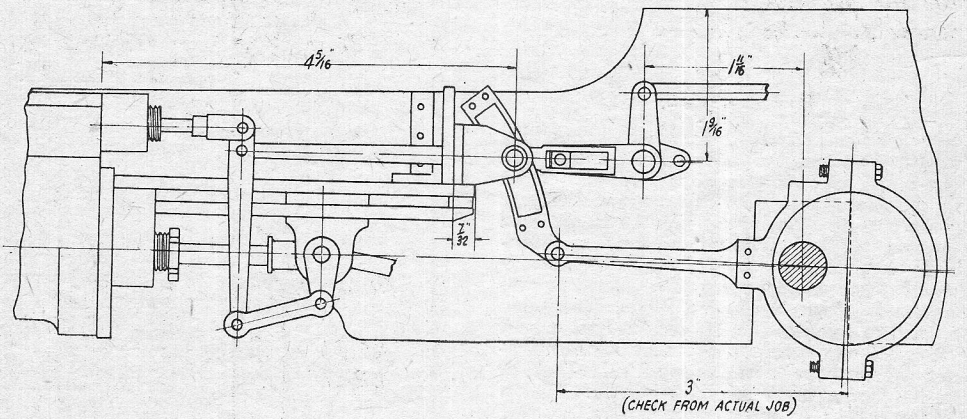


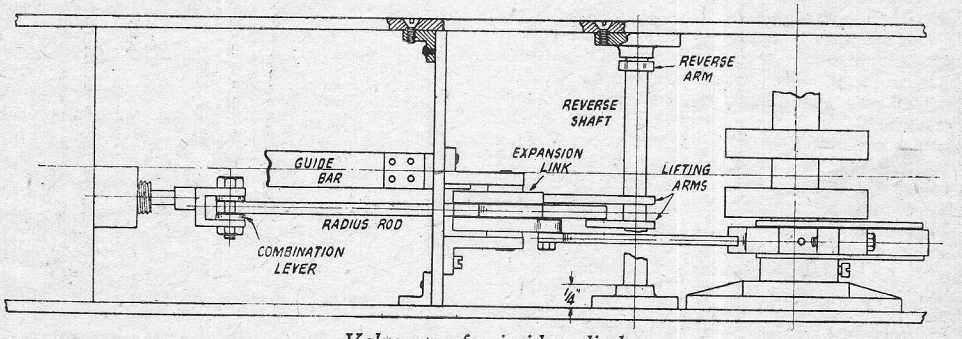
"Hielan' Lassie"

By "L.B.S.C."

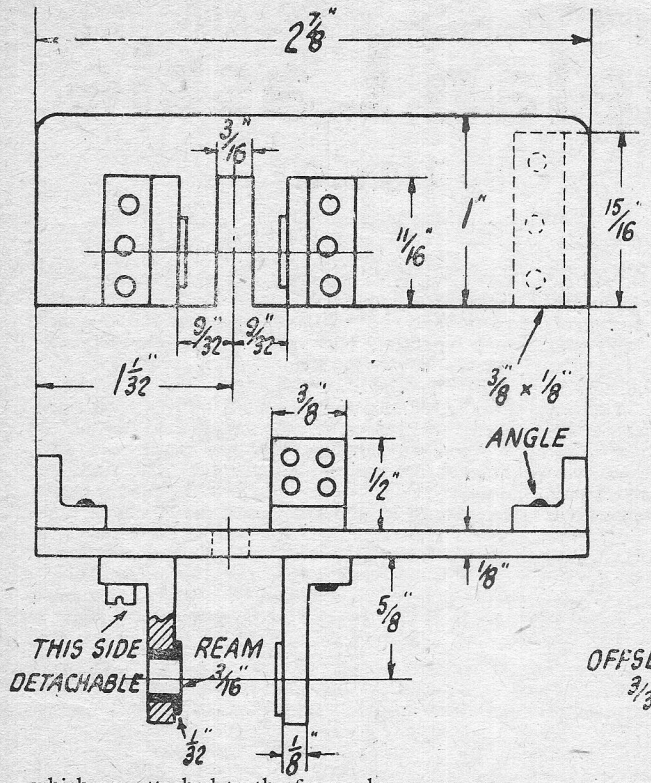
LO and behold the first results of your humble servant's efforts at doing sundry conjuring tricks with some pins, bits of cardboard, and strips of tin. Fine way to set out a valve-gear for an express passenger engine, isn't it? Yet up to now, all my valve-gears have managed to do the doings, so let's hope this one will follow suit. You can see from the plan and elevation of the complete assembly, that it is a "straight-line" motion, nothing having to be bent or set over, which reduces the chances of rods and levers being made to inaccurate lengths between centres of pinholes, and so increases the reliability of the gear. As the valve-gears of the L.N.E.R. engines are notorious for their light construction, due to the use of high-tensile heat-treated steels, I have endeavoured to keep the gear as neat as possible consistent with strength, and resistance to wear. Some of the component parts are the same as will be used in the outside valve-gears, and this will save repetition, both of instructions and illustrations, when we get that far along on the job.

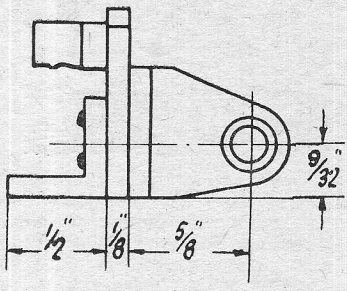
Briefly, the motion-plate—which may be a casting, or can easily be built up—extends right across the frames, serving a three-fold purpose as a frame-stay, support for the guide-bars, and bracket for the expansion-link. The latter is double, the radius-rod working between the two sections of it, and carrying a die-block on each side. The radius-rod is lifted and lowered by a die-block working in a slot in the end of the rod, and this die-block is carried between two lifting-arms which are attached to a reversing-shaft; this is carried by two bearings with oval flanges,



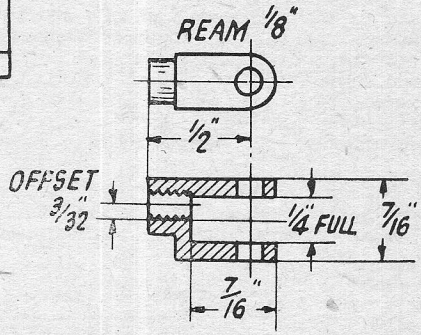


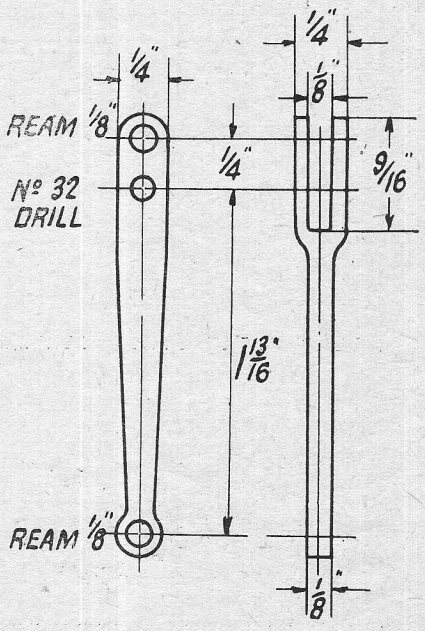
Valve-gear for inside cylinder





Inside motion-p at:



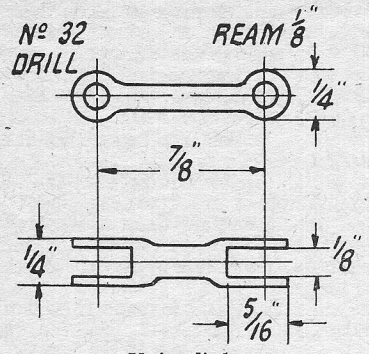


Valve-crosshead and combination-lever

which are attached to the frames by screws put through from outside. A reversing-arm at the right-hand end, is connected to a similar arm on the main reverse-shaft, which operates the gear for the outside cylinders, so that the whole issue works in unison. The tail of the expansion-link is waggled by an outsize in eccentrics, alongside the balanced crank; the eccentric was illustrated separately along with the description of the crank-axle. The lap-and-lead movement is attended to by the usual type of combination-lever working in a wide-jawed valve-fork or crosshead, screwed to the valve-spindle. That is all there is to it, so now to construction.

Motion Plate

If a casting is used, the side angles, the support for the guide bar, and one side of the link-bracket will be integral; both sides of the link-bracket cannot be cast on, or the link couldn't be got in between them. The detachable side of the link-bracket on a cast motion-plate is erected exactly the same as on a built-up one. To build up the plate, a piece of 1-in. by $\frac{1}{8}$-in. steel $2\frac{7}{8}$ in. long, is required, and this must be dead-square at each end, or it will pull the frames all cock-eyed when erected and screwed up; check with a try-square. The top corners are rounded off, as they project slightly above the frames. First rivet a piece of $\frac{3}{8}$-in. by $\frac{1}{8}$-in. angle $\frac{15}{16}$ in. long, to each end, for attachment to frames; see illustrations. Next mark a vertical line 1 1/32 in. from the left-hand end, with the angles pointing away from you; with this as centre, cut a slot $\frac{9}{16}$ in. wide and

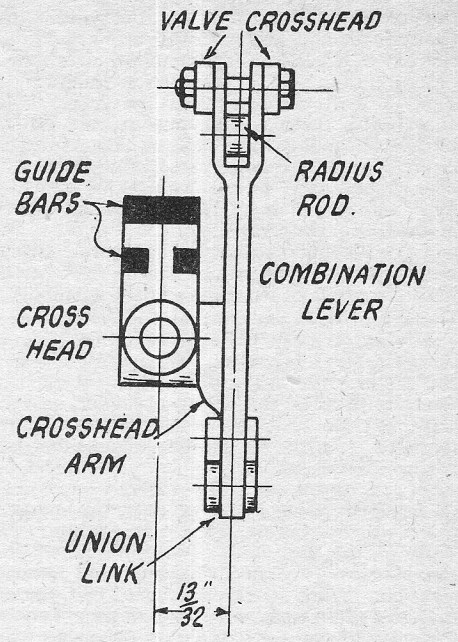


Union-link

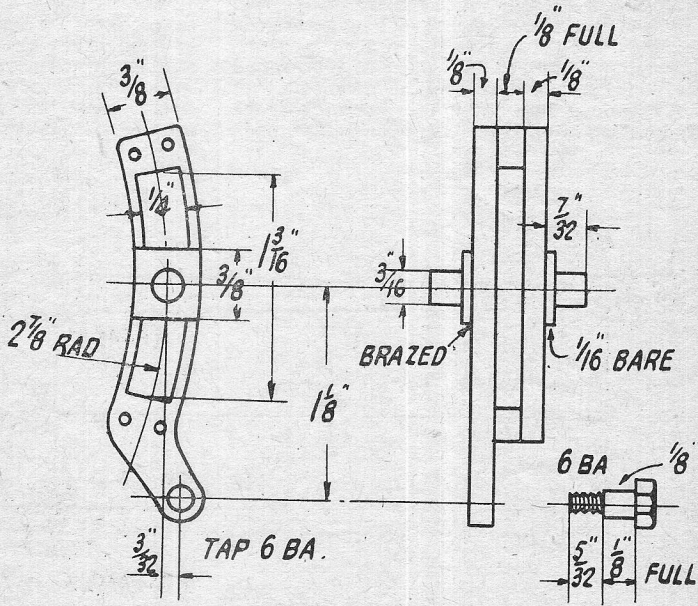
$\frac{11}{16}$ in. deep, to allow clearance for the radius-rod. A $\frac{3}{8}$-in. length of $\frac{1}{2}$-in. by 3/32-in. angle is then riveted in the centre and flush with the bottom of the side to which the fixing-angles are attached; this is to support the guide-bars. I have shown four No. 48 holes in this, to take four 9-B.A. screws, which are screwed into tapped holes in the guide-bar when the whole issue is erected, any projections below the guide-bar being filed off flush, to allow the crosshead to pass; but if you prefer it, a single 5/32-in. screw may be used instead, same as at the cylinder end.

The link brackets can be cut from a piece of $\frac{7}{8}$-in. by $\frac{1}{8}$-in. angle; or if you have any odd bits of buffer-beam angle left, they will do fine. The shape is shown in the illustrations; the side that butts up against the motion-plate is reduced to a width of $\frac{3}{8}$ in. Take care to get the position of the trunnion holes correct; they are 9/32 in. from the bottom of the bracket, and $\frac{5}{8}$ in. from the motion-plate end. Drill them 9/32 in., and turn up a couple of bronze bushes to squeeze in, the flanges of the bushes being $\frac{3}{8}$ in. diameter and 1/32 in. thick. Drill the bushes with a No. 14 drill, and ream them $\frac{3}{16}$ in. To erect correctly, first rivet on the fixed bracket; then put the removable one in place, hold it with a toolmaker's cramp, and put a piece of $\frac{3}{16}$-in. round silver-steel, or a $\frac{3}{16}$-in. drill shank, through both bushes. If this doesn't twist freely, shift the removable bracket about until it does. The bracket can then be attached by 3/32-in. screws, using the holes in the foot of it—which should be drilled before "offering it up"—as guides when locating the screw-holes, same as described for the cylinders and other screwed parts.

The motion-plate can then be erected. Set it back approximately 7/32 in. from the end of the guide bars, and check distance from cylinder block to centre of link-trunnion holes; this should be $4\frac{5}{16}$ in. Drill three No. 30 holes in the frame, in line with the angle at the end of the motion-plate, letting the drill just pierce the angles to locate the position of the tapped holes. You will, of course, have to take off



Lap and lead movement, showing clearances



Expansion-link

the outside cylinders to do this, but will find that the cylinder bolt-holes are well below and out of the way of the holes for the motion-plate screws. After locating, take out the motion-plate, run the No. 30 drill clean through the frame holes, countersink them on the outside, file off any burr, drill and tap the motion-plate angles for either $\frac{1}{8}$-in. or 5-B.A. screws, and replace, using countersunk steel screws with heads which go flush with the frame. Next, drill and tap the guide-bar for the screws to attach it to the central angle on the motion-plate (see assembly drawings) but the screws need not be put in " for keeps " until the whole of the gear is finally erected.

Combination-lever and Union-link

Now, to save needless repetition, may I remind all novices and beginners, that the easiest way to slot the end of a rod, to form a fork or clevis, is to clamp it under the lathe tool-holder, at right-angles to the bed, and run it up to a cutter mounted on a spindle (an old bolt does fine) held in the three-jaw. Run at slow speed and use plenty of cutting-oil. The end can be rounded off neatly by using a Wilmot filing jig as guide ; this is simply a button of the right diameter, with a pip on the end which fits the pin-hole. It is turned up from a scrap of silver-steel and hardened right out. When rounding a forked end, put one each side of the fork, and a piece of metal between the jaws, so that they won't get closed up when the whole lot is gripped in the vice.

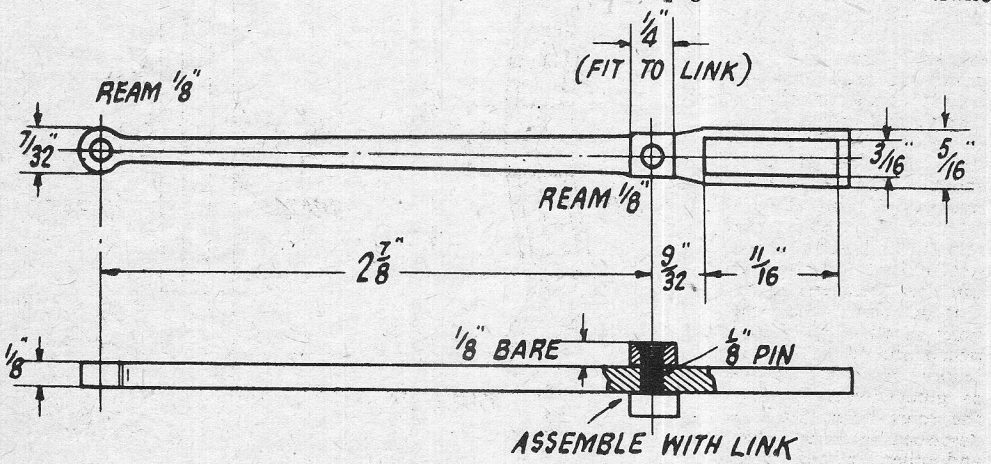
The combination-lever needs a piece of $\frac{1}{4}$-in. square mild-steel $2\frac{3}{8}$ in. long. First mark off the three holes, and drill *all* of them No. 32 ; then slot the top as described above. Next, mill or file away the sides, so that the thickness is reduced to $\frac{1}{8}$ in. below the fork ; then taper the rod as shown. Finally, round off the ends, as mentioned above, then poke a $\frac{1}{8}$-in. parallel reamer through the top and bottom holes. Easy job, that ! The union-link is made in much the same way, from a piece of $\frac{1}{4}$-in. square steel $1\frac{1}{4}$ in. long ; ream one end only. To assemble the two components, slightly taper the end of a piece of $\frac{1}{8}$-in. round silver-steel ; place the end of the union-link with the unreamed hole, over the bottom of the combination-lever, drive the $\frac{1}{8}$-in. steel through until all the tapered piece projects, then cut off the end and file flush each side. The end of the combination-lever should work easily on the pin, but not be in the least degree slack. It would be an advantage to case-harden all the eyes in the valve-gear, in which pins work. In that case, first try the pin in the hole, and be sure the fit is right. Then heat the eye to bright-red, and dip it in some good casehardening powder (Kasenit, Pearlite, Antol, or any other recognised brand). Re-heat until the yellow flame dies away and the compound has fused, then quench in cold water and clean up, taking care to have the eye perfectly free from grit.

The valve crosshead is made from a piece of $\frac{7}{16}$-in. by $\frac{1}{4}$-in. mild-steel rod. Drill the cross-hole first ; beginners note that if the hole is drilled from the solid, before slotting, there is no chance of the holes in the finished job being out of alignment. Then slot as above, round the end, and cut the piece to a little over finished length. Square-off the end with a file, then mark-off the centre of boss, 3/32 in. offset from the true centre, and make a punch-mark. Chuck in four-jaw with this running truly, then turn the outside, face to length, and drill and tap the boss to suit valve-spindle.

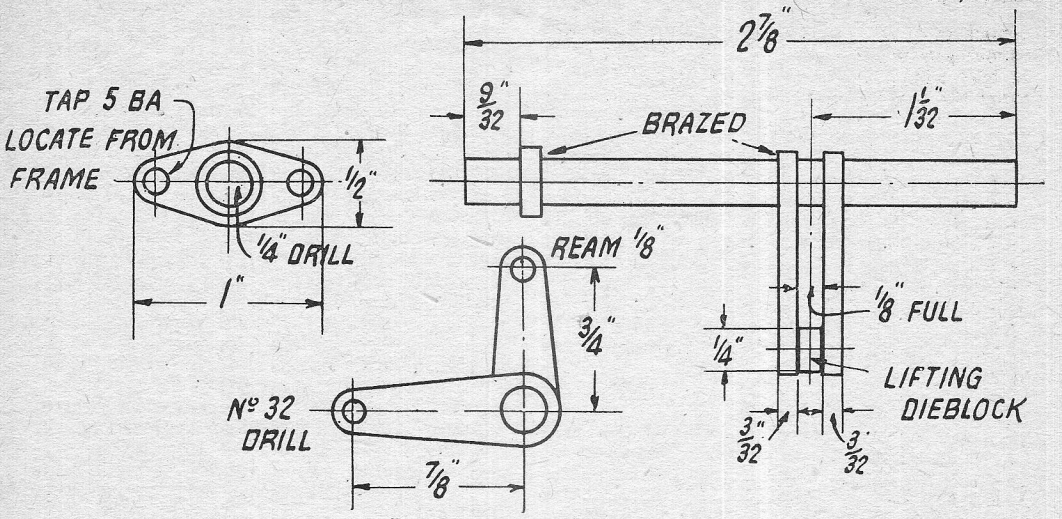
To erect, screw the valve crosshead right home on the end of the spindle ; it is a permanent fixture, as valve adjustment is effected by turning the spindle complete, in the nut in the back of the valve. The combination-lever is attached to the fork, and the union-link to the crosshead-arm, by little bolts made from $\frac{1}{8}$-in. silver-steel, nutted at both end. For neatness sake I always turn down the ends of the bolts and screw them either 3/32-in. or 8-B.A. ; the small nuts retain the bolts in place just as well as larger ones, and look ever so much better.

Expansion-links

Whilst these *can* be made by milling, it is an easier job for the average home worker to do them by hand, as the time taken in rigging up a radial milling apparatus, would far exceed the hand-work time. Mark the outline on a piece of $\frac{1}{8}$-in. steel ; gauge steel if you can get it—the commercial term is "$\frac{5}{16}$" ground flat stock." Otherwise



Radius-rod with die-blocks



Reverse-shaft and bearings

use ordinary mild-steel. Coat the metal with marking-out fluid if possible, as the scriber marks show up ever so much clearer. Drill a few $\frac{3}{16}$-in. or 7/32-in. holes down the centre of the slot, run into one with a rat-tail file, and finish with a fine half-round file until a piece of $\frac{1}{4}$-in. square silver-steel will slide from end to end without either shake or bind. Then file the outline of the link around the slot. The outline is not so important as the slot; if you filed the outline first and then got what the kiddies call a "wonky" slot, there would be wasted work and a flow of railroad Esperanto! Note—looking at the link with the convex part to your right, the side with the tail on is nearest to you, so bear that in mind when assembling the trunnions. These are made from $\frac{3}{8}$-in. square steel. Chuck truly in four-jaw, face the end, and turn down 5/32 in. length to $\frac{3}{16}$ in. diameter. Centre, and drill down $\frac{1}{4}$ in. depth with $\frac{1}{16}$-in. drill; part off to leave a flange $\frac{1}{16}$ in. thick. Set one on each half of the link, dead in the middle, and braze or silver-solder it in position; be mighty sparing with the silver-solder or spelter, so as not to get any in the slot. I usually hold these bits together for brazing, with a home-made cramp, like a toolmaker's cramp, but made from two bits of $\frac{1}{4}$-in. square rod held by commercial 4-B.A. screws. These cramps only take a few minutes to make, but they come in mighty handy; it doesn't matter a bean if they get hot, even red-hot when holding a brazing job, and quenching along with job doesn't worry them. Also, the cost is negligible. Little ones made from $\frac{3}{16}$-in. rod and 6-B.A. screws are especially handy for jobs like holding the half-round beading around the edge of a tender body, whilst soldering it. Brass clamps are better than steel for soldering jobs, as they don't go rusty with the soldering fluid.

The links are connected at top and bottom, to form one "double-sided" link, by pieces of steel approximately $\frac{3}{8}$ in. by $\frac{1}{4}$ in., and a full $\frac{1}{8}$ in. thick. You can use $\frac{1}{8}$-in. strip if you wish, but, in that case, the radius-rod must be filed slightly, to pass between the two sides of the link. Maybe you wondered what was the reason for drilling the trunnions; well, if you put a bit of $\frac{1}{16}$-in. silver-steel, or a $\frac{1}{16}$-in. drill shank, through the holes when assembling the two halves of the link, the trunnions are compelled to line up properly. Unofficial history tells us that Noah used the same wheeze to line-up the door hinges when building the Ark, but doesn't say whether he learned the trick from Adam! After lining-up, clamp one end of the assembly together whilst drilling and riveting the other; use bits of $\frac{1}{16}$-in. soft-steel wire for rivets, hammered down into countersunk holes and filed flush. The link tail is furnished with a little hexagon-headed crank-pin; tap it 6-B.A., and turn the pin to the dimensions given, from $\frac{1}{4}$-in. hexagon steel rod.

Radius-Rod

This will need a piece of $\frac{5}{16}$-in. by $\frac{1}{8}$-in. mild-steel a little over 4 in. long. The slot in the end is formed, same as the slots in the expansion-links, and is $\frac{3}{16}$ in. wide; test with a bit of $\frac{3}{16}$-in. square or flat silver-steel. The hole for the pin carrying the die-blocks, is drilled No. 32 at a distance of 9/32 in. from the end of the slot; and the distance from centre of that, to centre of the eye at the combination-lever end, is $2\frac{7}{8}$ in. File to outline as shown. The dieblocks should be made from silver-steel and hardened right out. It is essential that the holes in them should be exactly in line, so that both blocks work sweetly in the slots in the links, and here is an easy way of getting them accurate; one of the little things that the people who put engines on paper and not on the track, always "forget" to tell you about. They say airily "Bore the cylinders" and "turn the wheels"—do this, that, or the other thing, but *how*—ah! that's another story altogether; if the engine is a failure, well, that's *your* fault, not theirs! Anyway, get a bit of square silver-steel a little bigger than the slot, say $\frac{5}{16}$ in. square, and carefully file about $\frac{1}{2}$ in. of it until it fits the slot exactly. There is plenty of room to try it between the trunnion-blocks and the ends of the slot. When O.K.,

chuck truly in four-jaw, centre, and drill down about ½ in. with No. 31 drill. Part-off two slices a bare ⅛ in. wide, and there are your die-blocks with the pinholes dead in line. Countersink on the outside, ream ⅛ in., and harden right out. To assemble, push the radius rod through the link until the pin-hole shows between the sides of the slot; and drive a short bit of ⅛-in. silver-steel through it. Put a die-block on each side, letting them fall into the slots in the link; cut off and file almost flush, then slightly rivet over. Only rivet just enough to prevent the die-blocks coming off, then file the ends of the pins quite flush with the die-blocks. The radius-rod should now be free to move easily from top to bottom of the link, without slackness or tightness any place.

Reverse or Weighshaft

The shaft which carries the lifting-arms is a 2⅞-in. length of ¼-in. round steel; square-off the ends in the chuck. Both lifting- and reversing-arms are filed up from ⅜-in. by 3/32-in. steel strip; the former are ⅞ in. between centres of holes, and the latter ¾ in. Drill all holes No. 32, then ream top of reverse-arm ⅛ in., and open out all those in the large ends to a tight drive-fit on the shaft. If you haven't a letter "D" drill, use 15/64-in. and open out to drive-fit size with broach or reamer. Drive one of the lifting arms on to the shaft so that it is 1 3/32 in. from the end, then drive on the second one, to leave a gap ⅛ in. full between them; line up by putting a piece of straight wire or the shank of a No. 32 drill, through the holes in the end. Press the reverse arm on the other end, at 9/32 in. as shown; set at right-angles to the lifting arms, then braze or silver-solder all three to the shaft.

The die-block is a 7/32-in. length of ⅛-in. by ⅜-in. silver-steel, with a ⅛-in. reamed hole in the middle; harden it same as the other die-blocks. To assemble, put it in the slot in the radius-rod; set the lifting-arms of the reverse-shaft over it, and squeeze a bit of ⅛-in. silver-steel through the lot, filing flush each side. The bits of the valve-gear are gradually being coupled-up; all being well, the next instalment will show how to erect the lot.

Letters

Crankshaft Design

DEAR SIR,—I have noticed on more than one occasion Mr. Westbury has referred to the value of internal flywheels for taking the shock off the main bearings of an engine.

Surely this is a fallacy which may be easily disproved by the application of Newton's laws of motion. However, I am afraid readers do not welcome mathematical analysis, so let us take an analogy.

According to Mr. Westbury the more "massive the anvil," which we may consider a projectile, the smaller the force on the target. Obviously, this is wrong, since the force on the target, within the capacity of the projectile, depends on the resistance which the target can offer, the resistance of a paper target being negligible compared with armour plate. The resistance in turn depends on the rate at which the material can dissipate energy.

In the case of a crankshaft, floating on oil, the momentum acquired by the crankshaft assembly must be dissipated principally by the oil film. The more elastic the film the smaller the force on the bearing, but the longer its duration. In contrast a closely-fitted ball- or roller-bearing would not allow the crankshaft to move and, therefore, its inertia is ineffective, the shock load being taken directly by the bearing. Neither the mass nor the position of the flywheels, therefore, influence the dynamic load on the bearings.

The ability of a strong man to resist the cracking of stones on his chest by means of a sledge-hammer lies not in the mass and inertia of the stone, but on the ability of the stone, and the man, to dissipate energy rapidly. An ideal combination would be a sandbag reinforced beneath where the blow is to be applied, and supported on a chest full of air. It might be of interest to know that diving birds are fitted with pneumatic cushions to soften the shock of a high dive.

In conclusion, I would take this opportunity of saying how much I appreciate Mr. Westbury's articles, which are usually so sound and informative.

Yours faithfully,
Whitburn. D. A. WRANGHAM.

DEAR SIR,—With reference to Mr. Wrangham's criticism of my views on the benefits of internal flywheels, it is rather interesting to note that, while disagreeing with me on the theory involved, his argument only tends to support my contention from the practical point of view. My explanation was necessarily brief and incomplete, and it may be that I was not strictly correct in attributing the shock-absorbing properties of the flywheel purely to its inertia; but that it *does* actually absorb shocks is, I think, beyond question. I certainly did not state that "the more massive the anvil, the smaller the force on the target"; but as Mr. Wrangham agrees, the kinetic energy of the impact applied to the anvil can be transmitted to the "target" in the form of a lighter load over a longer period of time. Obviously, all the force applied must be accounted for; but it is the maximum *impact* load which is principally responsible for the destruction of the shaft and bearings, either by disruption or attrition.

In crankshafts which have no large masses of metal in the vicinity of the crankpin, torsional deflection takes place, which provides some measure of shock damping, so long as the forces encountered are well within the elastic and fatigue strength limits of the metal. But there is a risk that torsional deflection may develop into torsional vibration, which can be, and often is, a very serious problem in large engines, though I have not encountered any trouble traceable to this cause in small models. In quite a number of cases, however, lightly-built shafts have been found to be deflected, or "wound up," per-

manently, to a measurable extent, and this is particularly noticeable in multi-cylinder engines.

This may perhaps be a little beside the point, which is whether internal flywheels do or do not absorb shocks—a point on which I should welcome the opinion of other readers—but it does at least show that the importance of good and carefully-thought-out detail design, in any highly-stressed mechanism, cannot be too strongly emphasised.

Yours faithfully,

Surrey. EDGAR T. WESTBURY.

Model Motor-cars

DEAR SIR,—I was very interested to read Mr. Boddy's article on motor-car models, and particularly in the reference to the models of the 1,000-h.p. Sunbeam and the Golden Arrow record-breaking cars, as I am the designer of these cars.

In addition to the Kingsbury models mentioned by Mr. Boddy, there were other models made; for instance, I had about fifty 1/10-scale models made of both cars, which were distributed to the firms who supplied material, and samples of each were presented to the Institution of Automobile Engineers. These were true to scale and assembled from aluminium castings.

A now-defunct Halifax firm—Automobiles (Geographical) Ltd.—also marketed models of both cars about 1/20-scale; these were interesting as they had Ackerman steering, detachable wheels, Dunlop tyres, etc., and were driven by a powerful clockwork motor.

These models were made in plastic material, which was novel in those days, the reason being that the designer's son had had a serious illness caused by a scratch from a "tin" model, and he set out to design a series of toys which would not cause such injuries.

Both models were retailed at 25s. each and some thousands were sold before the firm went out of business.

This information may be of interest to your readers.

Yours faithfully,

Birmingham. J. S. IRVING.

Locomotives Worth Modelling

DEAR SIR,—As a very old reader of THE MODEL ENGINEER, and being old enough to have seen the last down G. W. Railway "broad gauge" pass Taplow Station, I want to say how much I have and do enjoy the articles written by Mr. F. C. Hambleton, whether they relate to those lovely old paddle-steamers, or those wonderful old locomotives, which he describes and enthuses over with such delightful phrases, that it almost make one's mouth water and look forward to the next engine or ship with eager anticipation.

I remember when, as a boy, I passed over London Bridge on my way to the City, especially on a Saturday morning, and seeing the wonderful display of paddle-steamers, both on the upper and lower side, collecting passengers for the coast, that I had a difficult job to drag myself away.

Then again, a little earlier I went to school from Paddington and had a good chance to feast my eyes on, what then seemed to me to be, the great "broad-gauge" giants with their very frequent display of slipping when trying to start; the cause of this appeared to be the very stiff regulator.

May I put in a plea for Mr. F. C. Hambleton to continue this good work for many years to come?

Yours faithfully,

West Wickham. G. W. VICKERAGE.

Clubs

The Society of Model and Experimental Engineers

There will be a meeting of the society on Saturday, June 15th, at 39, Victoria Street, Westminster, S.W.1. On this occasion, Mr. F. S. Lovick-Johnson, M.I.Loco.E., will give a talk on the "Merchant Navy" class locomotive. This talk will be illustrated by slides and cinema film. Meeting commences at 2.30 p.m.

A rummage sale will be held at the workshop, on Saturday, June 22nd. Bidding will be commenced at 2.30 p.m.

Members of affiliated societies will be welcomed at both these meetings.

Full particulars of the society may be obtained from the Secretary: J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

Godalming and District Society of Model Engineers

Meetings are held on the first Sunday of each month, at 3 p.m., and the third Wednesday, at 7.30 p.m., at the Broadwater Hotel, Meadrow, Farncombe.

Our thanks are due to T. E. Chrimes, of the Southern Railway, for an instructive visit to the Guildford locomotive sheds, recently made by our members. Visits to other industrial establishments are in course of preparation.

Hon. Secretary: J. BOURREL, 4, Surrey House, Cranleigh.

Cardiff and District S.M.E.E.

The well-attended meeting of May 1st must have been gratifying to Mr. E. T. Westbury on the occasion of his visit, as indeed, he mentioned that fact in conclusion of his most interesting lecture.

Although Mr. Westbury emphasised that he was not exactly after converts to small petrol engines, it seems certain that he must have made quite a few during the evening, if the rapt attention of his audience was anything to go by, while the demonstration run by one of his latest "Atoms" should shatter all doubts as to its capabilities.

Altogether a "very special occasion," the meeting was closed (are meetings ever closed?) in the usual spirit of camaraderie of that particular brand only encountered by model makers.

Meetings are held on the first and third Wednesdays of each month.

Hon. Secretary: F. B. ANGWIN, 47, Rommilly Crescent, Canton, Cardiff.

Oldham Society of Model Engineers

We shall meet on Friday, June 7th, in No. 3 Room, Co-operative Educational Building, Foundry Street, Oldham, at 7.30 p.m., when Mr. F. Miller will give a talk entitled, "Mental Meanderings of a Mechanic."

Mr. Barnett gave his talk on "Plastics" at our last meeting, and was well received. Visitors and friends will be welcome at any of our meetings.

Hon. Secretary: W. K. BUCKLEY, 87, Lyme Terrace, Highfield, Mossley, Lancs.

The Mancunian Model Engineering Society

At the annual general meeting, fresh officers elected were: Mr. Ashworth, Chairman; Mr. J. Meadows, Hon. Secretary and Treasurer, with Mr. G. Garvin, Assistant Secretary.

Correspondence should in future be addressed to Hon. Secretary: J. MEADOWS, 90, Bank Street, Clayton, Manchester, 11.

The Bolton and District Society of Model Engineers

The next meeting to be held on Tuesday, June 11th, at 7 p.m., will be a "bits and pieces" meeting. Members are asked to bring materials and partly constructed models either for show or for sale. It is intended to focus the discussion on the parts that are brought to the meeting.

Hon. Secretary: A. H. BOOTHROYD, 113, Hilton Lane, Little Hulton, Near Bolton.

Bristol Ship Model Club

At the meeting on May 14th, some twenty-six members and visitors were given an interesting talk by Mr. Dorrinton on his model ship, *Lady Lisa*. The hull of this model is carved from a solid block of yellow pine, and is of average thickness of $\frac{1}{4}$ in.

Power is supplied by a small electric motor, driven by 6-volt batteries, and the boat needs some 4 lb. of ballast to bring her down to correct level. The fittings include saloon furniture, blue upholstered chairs, etc., geared winches from small watch parts; rigging and finish were of Mr. Dorrinton's usual standard. We understand that the model will be on show in London in August.

The next meeting is on June 18th at the Club Headquarters, Prince Street, when Mr. Edward Bowness will give a talk on "How to Read Drawings." All interested should write to the Hon. Secretary: ARTHUR W. KIRTON, 29, New Fosseway Road, Knowle, Bristol, 4.

Bournville Model Yacht and Power Boat Club

We are holding our Annual Power Boat Regatta on Whit-Monday, June 10th, and sincerely hope to see a good entry to compete for the trophies.

There will be a race for hydroplanes, 15-c.c. and under; also, for 30-c.c. boats for the Coronation Trophy, and a steering competition for the A. Hackett trophy; also, we hope, a nomination race for speed boats.

We hope to start at 2.30 p.m. and have available some light refreshments. Any members of other clubs will be heartily welcome. Any intimation of who might be coming will be appreciated.

Hon. Secretary: A. H. HARLOW, c/o Cadbury Bros. Ltd., Bournville, Birmingham.

Mansfield and District Model Engineering and Handicrafts Society

Our workshop is now open every night to those members who possess keys. Work has commenced on three society locomotives, copper tube and steel-plate is to hand for these $7\frac{1}{4}$-gauge engines, and as we wish to get at least one engine finished in record time for holiday track running, maximum attendance by all members is important.

Hon. Secretary: J. CORBETT (Lathes), Stanton Hill, Mansfield. Tel.: 583 Sutton-in-Ashfield.

The Bristol Society of Model and Experimental Engineers

Our meeting at St. Nicholas' Parish Hall, Trinity Place, on Thursday, May 9th, was well attended, and we had the privilege of seeing films loaned by Mr. Coles, of the Kodak Recreation Society Experimental Engineers and Craftsmen, whose kindness was much appreciated, especially by the interest taken in the films that were shown.

Hon. Secretary: C. C. LUCY, 28, Bibury Crescent, Henleaze, Bristol.

Maidstone Model Engineering Society

A second general meeting of members of the above society was held at the Maidstone Technical Institute, Maidstone, on Tuesday, May 7th, It was a purely business meeting, the chief items on the agenda being to draw up a set of rules, to decide upon subscriptions, and the election of officers.

It was also decided that a multi-gauge track should be constructed, in the gauges of $2\frac{1}{2}$ in., $3\frac{1}{2}$ in. and 5 in., since there are several members who are "live steam" modellers.

The portable "O"-gauge electric track is also to be completed for use at exhibitions.

It was decided that there should be an exhibition of members' work held in the autumn, at a date to be fixed later, in order that as much publicity as possible may be given to the society's activities.

Facilities for the use of the Technical School workshops on one evening per week during the winter months have also been arranged, and an instructor will be present to advise on any point which members may be in need of assistance.

The next meeting is arranged for June 28th, at the Technical Institute, at 7.30 p.m., and members are asked to bring along any work they have for the exhibition. The meeting will be an informal discussion on the work brought along.

Hon. Secretary: J. ELBOURN, 91, Old Tovil Road, Maidstone, Kent.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

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